State of California
The Resources Agency

DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS 1999

November 2004

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Printed by DWR Reprographics

Foreword

This is the twenty-sixth in a series of annual reports summarizing the water and energy operation of the California State Water Project. Although the reports in this series are published considerably after the reference year, they document the official record of operations and provide an important source of historical data. This report summarizes the operation of Project facilities during 1999 and includes any revisions to data previously published in the more timely monthly "State Water Project, Operations Data" reports.

Chief
Division of Operations and Maintenance

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Conversion Factors

Quantity	Multiply	By	To obtain
Area	acre	43,560	square feet
Volume	cubic foot	7.481	gallons
	cubic foot	62.4	pounds of water
	gallon	0.13368	cubic feet
	acre-foot	325,900	gallons
	acre-foot	43,560	cubic feet
	million gallons	3.07	acre-feet
Flow	cubic foot/second (cfs)	450	gallons/minute (gpm)
	gallons/minute	0.002228	cubic feet/second (cfs)
	million gallons/day	1.5472	cubic feet/second (cfs)
	cubic foot/second (cfs)	646,320	gallons a day
	cubic foot/second (cfs)	1.98	acre-feet a day
	million gallons/day (mgd)	1,120	acre-feet a year
Pressure	feet head of water	.433	pounds/square inch (psi)
Power	kilowatts (kW)	1.3405	horsepower (hp)

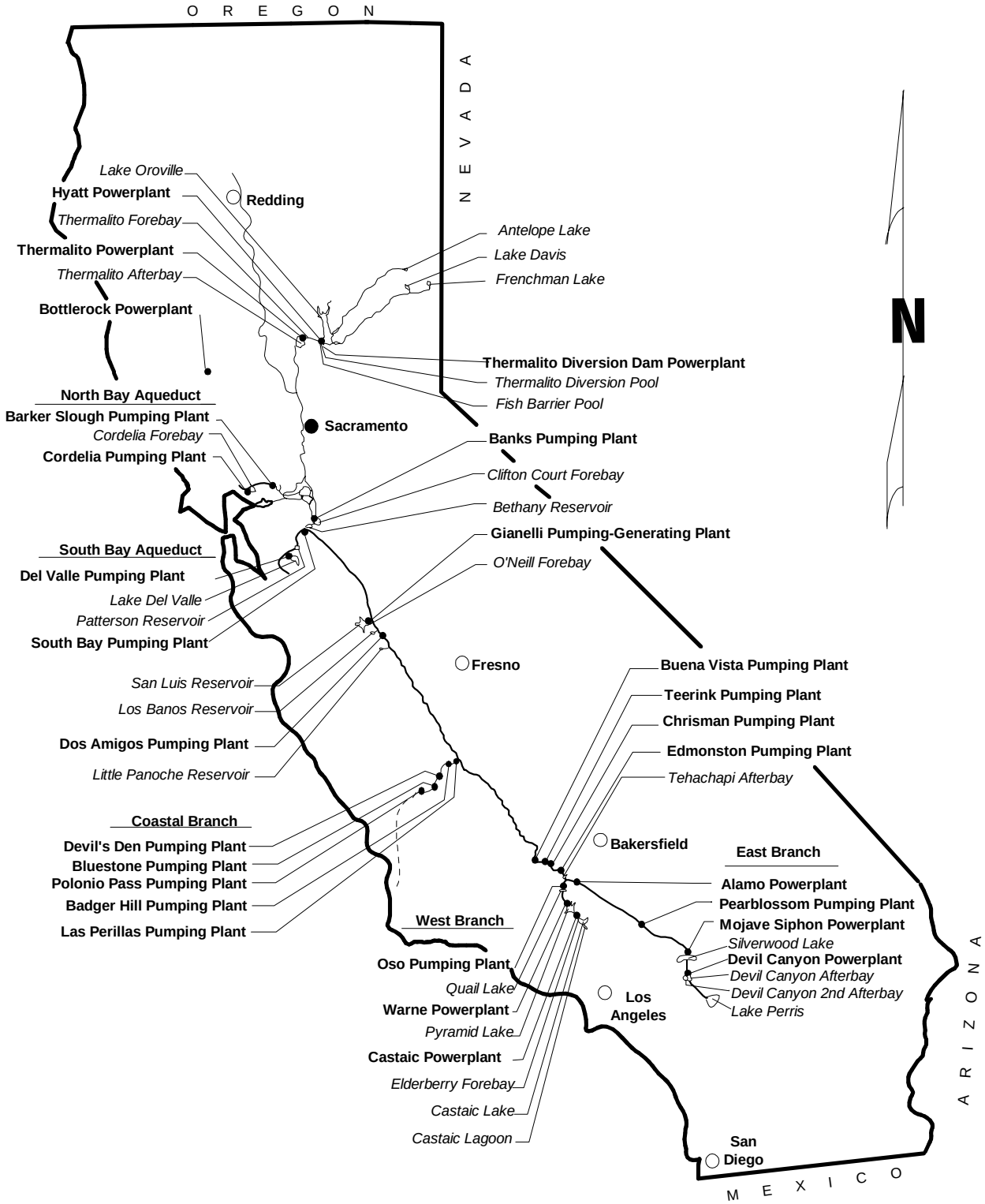
Abbreviations and Units

The following abbreviations are commonly used throughout this report.

AF	acre-feet
Banks	Harvey O. Banks Delta Pumping Plant
California Aqueduct	Governor Edmund G. Brown California Aqueduct
CEA	Capacity Exchange Agreement
cfs	cubic feet per second
CVP	Central Valley Project
D-1485	Water Rights Decision 1485
DFG	Department of Fish and Game
DO	dissolved oxygen
DOI	Delta Outflow Index
DPR	Department of Parks and Recreation
DWR	Department of Water Resources
EC	electrical conductivity
FRSA	Feather River Service Area
ft	feet
KCWA	Kern County Water Agency
kv	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LADWP	Los Angeles Department of Water and Power
MAF	million acre-feet
MW	megawatt
MWh	megawatthour
MWDSC	Metropolitan Water District of Southern California
NDOI	Net Delta Outflow Index
PG&E	Pacific Gas and Electric Company
SCE	Southern California Edison
SDWA	South Delta Water Agency
SRI	Sacramento River Index
SWP	State Water Project
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation

Map 1

Project Facilities



Introduction

The 1999 Annual Report of Operations for the State Water Project is divided into seven parts. The first two parts, "Highlights of 1999 Operation" and "Project Status in 1999," cover conditions and events of statewide significance. The following three sections cover water conditions, water operations, and energy operations in 1999. The sixth part, "Sacramento-San Joaquin Delta Operations," gives special emphasis to Delta operations, a key aspect of the SWP. The last part, "Project Operations by Field Division," provides details on activities by field division as outlined on Map 2.

Highlights of 1999 Operation

Managing available water supplies during the 1987-1992 drought required activities designed to make the most beneficial use of water available to the SWP. The Department of Water Resources initially structured its plan of operations according to the concept of a firm yield. Firm yield is the quantity of water that can be made available on a firm annual basis to water contractors during a drought period. In 1991, after years of discussion, DWR changed its method of determining delivery amounts and replaced the concept of firm yield with the concept of variable yield. Operating on the basis of a variable yield makes efficient use of available water supplies during a drought. DWR also developed programs to compensate for the lack of storage facilities. These programs include water transfers, exchanges, loans, storage, purchases, and carry-over Table A for delivery at a later date.

Total original requests for Table A water were about 3.42 MAF. The initial allocation in December 1998 provided for 55 percent of Table A or 2.24 MAF. On February 10, 1999, due to increased supplies, DWR approved 60 percent of Table A or 2.44 MAF. As a result of additional improvements in water conditions and a reduction in SWP contractor requests to 3.19 MAF, allocations were further increased to 100 percent on March 10, 1999.

Runoff in Central Valley rivers was less than in water year 1997-98 but still well above average, except in the southern end of the Sierra from the Merced River south. The Sacramento River Index runoff was just over 21 MAF, making it the fifth wet year in a row. The San Joaquin River Index runoff was slightly under 6 MAF, just over average. The year was classified as “above normal,” and as a result, water year 1998-99 ended the run of 4 wet years on the San Joaquin River system.

Water year 1998-99 was wet in Northern California, but less than the previous very wet year. Surface temperature patterns in the eastern tropical Pacific switched from warmer to cooler than normal-from El Nino to La Nina. California precipitation followed a typical La Nina pattern of dry in Southern California and above normal in the northern part of the State. The north to south gradient in annual precipitation, snowpack, and runoff in the southern Sierra Nevada was one of the steepest in history. Figure 8-1 shows statewide precipitation by hydrologic region. The southern tier was very dry.

Although some stations on the Napa and Sacramento Rivers exceeded flood stage briefly on February 7 and February 9, water year 1998-99 was a mild year for flood control.

DWR and USBR declared balanced Delta water conditions from June 25 through November 8 and from December 9 through December 31 during 1999.

The SWP depends on a complex system of dams, reservoirs, Powerplants, pumping plants, canals, and aqueducts to deliver water. Although initial transportation facilities were essentially completed in 1973, other facilities have been constructed since then and still others are under construction or are scheduled to be built as needed. The SWP facilities now comprise 27 dams and reservoirs, 25 pumping and generating plants, and nearly 600 miles of aqueducts.

Energy resources totaled 9,988,924 MWh including generation of 6,586,833 MWh from SWP energy sources, purchases of 1,230,772 MWh, and 2,171,319 MWh of return additional (see Figure 4). Energy loads of 9,988,924 MWh include sales of 4,231,399 MWh, 5,480,631 MWh used to deliver water to SWP contractors, and losses and system imbalances of 276,894 MWh (see Figure 6).

SWP facilities delivered 5,316,798 AF of water to 43 agencies, including 27 long-term water contractors, in 1999 as shown on Table 2. This amount is approximately 1.5 MAF more than the combined State and federal water deliveries from the SWP in 1998. State contractor deliveries were 2,965,038 AF; including 2,540,616 AF of Table A water and 424,422 AF of other water; excluding Joint Facilities and prior water right deliveries. See the *"Water Deliveries and Aqueduct Operations"* section for more details on water deliveries.

Map 2
Field Division Boundaries

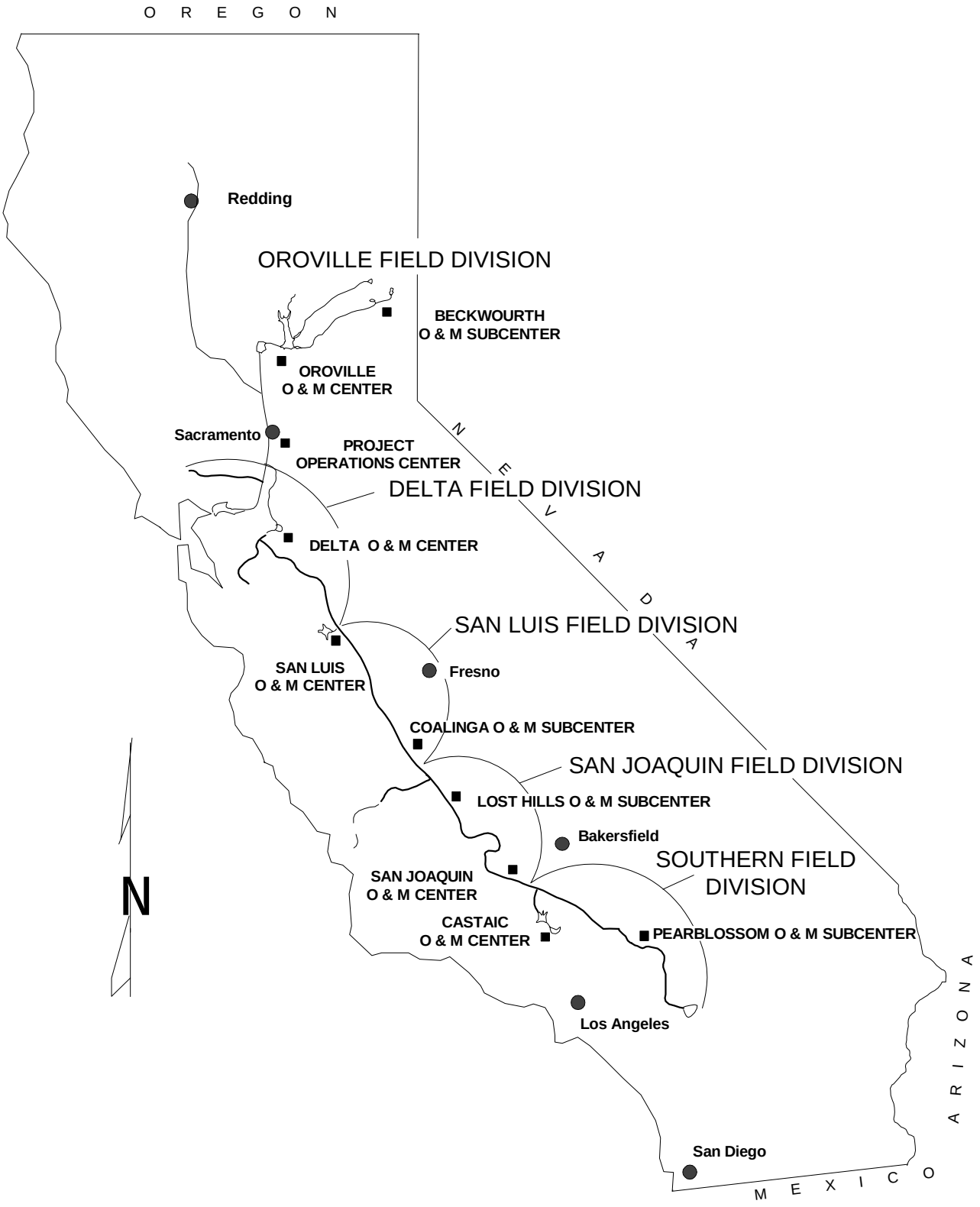


Table 1. Project Pumping by Plant

1999

(in acre-feet)

Pumping Plants	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt	0	0	0	0	0	0	0	0	32,582	835	9,970	10,002	53,389
Thermalito	0	0	0	0	0	0	0	0	31,979	1,420	10,970	11,077	55,446
Barker Slough	2,673	1,400	916	733	2,966	4,110	6,053	5,822	4,955	5,125	3,588	4,238	42,579
Cordelia	2,469	1,298	832	653	1,961	2,396	2,775	2,450	1,915	2,432	2,525	3,160	24,866
Banks													
State	85,366	35,922	182,800	185,666	99,261	59,277	376,107	409,354	408,580	294,498	300,417	233,883	2,671,131
Federal	0	16,281	0	0	0	0	0	0	0	9,048	10,375	0	35,704
Total	85,366	52,203	182,800	185,666	99,261	59,277	376,107	409,354	408,580	303,546	310,792	233,883	2,706,835
South Bay	6,110	5,807	3,819	4,353	7,562	10,849	15,105	16,864	16,134	11,764	6,963	11,893	117,223
Del Valle	328	1,479	0	0	0	64	107	47	42	419	0	1,576	4,062
Gianelli 1/													
State	39,280	-839	-390	2,775	0	0	12,800	76,604	151,990	42,839	125,127	85,339	535,525
Federal	52,831	75,045	91,800	6,131	0	0	0	14,262	61,368	129,105	172,023	103,471	706,036
Total	92,111	74,206	91,410	8,906	0	0	12,800	90,866	213,358	171,944	297,150	188,810	1,241,561
O'Neill 2/													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	135,047	168,458	177,377	41,669	701	17,170	29,189	70,917	90,434	136,748	189,813	132,049	1,189,572
Total	135,047	168,458	177,377	41,669	701	17,170	29,189	70,917	90,434	136,748	189,813	132,049	1,189,572
Dos Amigos 1/													
State	42,568	34,242	213,619	222,939	231,261	355,430	431,547	402,735	240,473	286,523	172,671	173,836	2,807,844
Federal	115,419	107,134	83,264	67,665	163,724	224,019	253,781	121,253	38,703	13,870	15,736	41,214	1,245,782
Other 4/	0	0	0	0	0	0	0	0	0	9,280	10,392	0	19,672
Total	157,987	141,376	296,883	290,604	394,985	579,449	685,328	523,988	279,176	309,673	198,799	215,050	4,073,298
Las Perillas	3,427	5,199	8,035	9,744	13,913	19,795	21,610	16,879	10,012	7,416	2,705	3,779	122,514
Badger Hill	3,427	5,199	8,035	9,744	13,913	19,795	21,610	16,879	10,012	7,416	2,705	3,779	122,514
Devil's Den	1,181	1,109	1,438	1,504	2,376	2,294	2,985	2,719	2,636	2,301	1,335	1,578	23,456
Bluestone	1,201	1,127	1,453	1,527	2,424	2,332	3,016	2,715	2,425	2,146	1,214	1,441	23,021
Polonio Pass	1,226	1,156	1,493	1,555	2,451	2,370	3,055	2,776	2,693	2,394	1,381	1,633	24,183
Buena Vista	9,202	10,096	125,493	106,921	84,077	102,197	138,257	132,537	115,509	147,574	82,293	126,644	1,180,800
Teerink	4,779	3,507	118,799	102,011	72,262	83,601	120,118	118,619	111,943	146,545	81,675	125,555	1,089,414
Chrisman	4,265	2,947	113,591	97,873	65,661	75,122	110,450	111,969	106,849	141,177	79,248	121,641	1,030,793
Edmonston	3,842	2,670	112,550	96,516	62,993	70,677	104,895	107,722	102,701	135,774	77,806	122,472	1,000,618
Oso	0	714	64,009	53,809	17,280	10,676	24,394	33,074	31,190	51,518	63,214	42,089	391,967
Castaic 3/	71,452	48,249	32,667	67,979	119,220	127,199	122,402	133,383	118,422	81,547	56,610	60,223	1,039,353
Pearblossom	2,177	0	40,709	34,173	32,830	46,063	64,174	59,060	58,656	73,127	10,320	75,091	496,380

1/ Joint state-federal facility.

2/ O'Neill Pumping Plant is a federal facility.

3/ Pumping at Castaic Pumping Plant is for the city of Los Angeles.

4/ Pumping at Dos Amigos for Cross Valley Canal and delivered to Westlands Water District.

Project Status in 1999

Project Facilities

The SWP conserves water for distribution to much of California's population and to irrigated agriculture. It also provides flood control, water quality control, electrical power generation, new recreational opportunities, and enhancement of sport fisheries and wildlife habitat.

SWP facilities in operation during 1999 included: 27 water storage facilities, 3 pumping-generating plants, 5 Powerplants, 14 pumping plants, and nearly 600 miles of aqueduct.

The SWP begins with three small lakes on the Feather River tributaries: Lake Davis, Frenchman Lake, and Antelope Lake. The branches and forks of the Feather River flow into Lake Oroville, the SWP's principal reservoir with a capacity of about 3.5 MAF. From Oroville, water flows through a complex system of powerplants, then down the Feather River into the Sacramento River before reaching the Delta. From the northern Delta, water is supplied to Napa and Solano counties through the North Bay Aqueduct.

Near Byron, in the southern Delta, the SWP diverts water into Clifton Court Forebay for delivery south of the Delta. The Banks Pumping Plant lifts water into Bethany Reservoir. The South Bay Pumping Plant then lifts it into the South Bay Aqueduct. Through the South Bay Aqueduct water is supplied to Alameda and Santa Clara Counties. Most of the water from the Bethany Reservoir, however, flows into the Governor Edmund G. Brown California Aqueduct. At O'Neill Forebay, part of the water is pumped through the Gianelli Pumping-Generating Plant for storage in San Luis Reservoir until needed. DWR's share of storage in the reservoir is 1,062,183 AF.

Water not stored in San Luis Reservoir continues its flow south and is raised 1,069 ft by four pumping plants: Dos Amigos, Buena Vista, Teerink, and Chrisman. In the southern San Joaquin Valley, the Coastal Branch Aqueduct serves agricultural areas west of the California Aqueduct. At the Tehachapi Mountains, Edmonston Pumping Plant raises the water 1,926 ft as it enters 8.5 miles of tunnels and siphons. Once the water has crossed the Tehachapi Mountains, it flows through the California Aqueduct into the Antelope Valley.

The California Aqueduct then divides into two branches, the East Branch and West Branch. The East Branch carries water through the Antelope Valley into Silverwood Lake. From Silverwood Lake, the water enters the San Bernardino Tunnel and drops 1,418 ft into Devil Canyon Powerplant, then to Lake Perris, SWP's southernmost reservoir.

Water in the West Branch flows through Warne Powerplant into Pyramid Lake. From Pyramid Lake the water flows through the Angeles Tunnel and Castaic Powerplant into Castaic Lake, terminus of the West Branch. For the location of facilities cited here, see Map 1.

Lake Oroville and San Luis Reservoir are the primary conservation facilities of the SWP's 27 dams and reservoirs. The remaining 25 dams and reservoirs are used principally to regulate the conserved supply into water delivery patterns designed to fit local needs. Of those 25, the five largest are Lake Del Valle located in Alameda County; Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris, in Southern California. Lake Del Valle is approximately four miles from the city of Livermore. The four southern reservoirs--Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris--are near the metropolitan areas of southern California, where water supplies are mainly imported. Information about these reservoirs, including amounts of unimpaired runoff to Lake Oroville and storage levels for SWP's conservation, and other storage facilities are summarized in this report.

Outages and Limitations

Major outages, construction, and operating limitations of SWP facilities during 1999 were:

January

- Pearblossom Pumping Plant Units 1, 2, 4, 5, 6, 8, and 9 out of service from January 4 to March 3 due to Pool 59 repairs.
- Chrisman Pumping Plant Unit 8 out of service from January 4 to May 24 for transformer KYD rewind.
- Alamo Powerplant Unit 1 out of service from January 5 to March 2 to inspect seals and rebuild governor.
- Devil Canyon Powerplant Unit 2 out of service from January 11 to March 5 for annual maintenance.
- Las Perillas Pumping Plant Units 1, 2, 3, and 4 out of service from January 11 to February 18 to replace motor switchgear.

Table 2. Water Deliveries 1962-1999

(in acre-feet)

Agency		1962-1994	1995	1996	1997	1998	1999	TOTALS
Oroville Field Division								
Last Chance Creek W.D. (Local Supply)		223,404	8,919	11,404	12,590	10,046	12,241	278,604
Plumas Co. F.C. & W.C.D.*		9,573	308	360	231	469	0	10,941
County of Butte*		7,424	203	257	189	528	287	8,888
Thermalito I.D. (Local Supply)		32,793	2,321	2,613	1,730	2,271	2,567	44,295
Prior Water Rights Deliveries	1/	21,293,647	849,324	921,737	991,710	860,421	1,094,989	26,011,828
Yuba City*		4,474	910	820	1,005	1,054	1,096	9,359
Delta Field Division								
Napa CO. F.C. & W.C.D. *(Local Supply)	5/	152,664	5,182	4,893	4,341	5,359	5,304	177,743
Alameda Co. W.D.* (Local Supply)		625,464	23,085	23,850	25,022	26,580	29,544	753,545
A.C.F.C. & W.C.D., Zone 7* (Local Supply)		564,710	42,171	37,582	40,372	37,044	43,024	764,903
Pleasanton Township W.D.		674	0	0	0	0	0	674
Santa Clara Valley W.D.*		1,811,631	28,756	44,850	60,601	39,610	52,945	2,038,393
Marin W.D.		4,594	0	0	0	0	0	4,594
San Francisco W.D.		82,286	0	0	0	0	0	82,286
Skylonda M.W.D.		10	0	0	0	0	0	10
Oak Flat W.D.*		139,174	5,169	4,904	5,238	4,286	4,871	163,642
Mustang W.D.		4,256	0	0	0	0	0	4,256
Granite Construction		120	0	0	0	0	0	120
Lake Del Valle (E.B.R.P.D.)		2,610	146	150	155	0	0	3,061
Orestimba Creek		100	0	0	0	0	0	100
Recreation Fish and Wildlife		4,397	0	0		114	139	4,650
CVP Water		5,570	213	298	376	513	607	7,577
Solano Co. F.C.W.C.D.*		165,054	21,345	29,999	33,530	29,766	34,753	314,447
San Luis Field Division								
Dept. Parks & Rec. (STATE)		989	67	76	93	72	93	1,390
Dept. Fish & Game (STATE)		8,291	651	753	270	336	812	11,113
Fed. Customers (Rec.+ Joint-Use)		27,111,390	1,207,876	1,491,450	1,493,362	1,013,030	1,256,771	33,573,879
Fed. Customers (Misc.)		248,151	50	348	43	7,117	29	255,738
Westlands Water District		10,900	0	0	0	136,519	130,969	278,388
San Joaquin Field Division								
Tulare Lake Basin W.S.D.*		2,823,010	139,869	238,070	20,469	17,677	262,451	3,501,546
Empire West Side I. D.*		84,664	1,631	1,868	0	542	3,176	91,881
County Of Kings*		59,822	4,000	4,000	0	15	4,000	71,837
Hacienda W.D.	2/	75,895	0	0	0	0	0	75,895
Kern County Water Agency*		19,985,202	1,066,723	1,022,516	841,319	757,771	1,107,539	24,781,070
Kern Water Bank	4/	7,501	0	0	0	0	0	7,501
Dudley Ridge Water District*		1,317,234	45,485	53,353	68,638	55,450	59,611	1,599,771
Devils Den Water District		339,947	0	0	0	0	0	339,947
J.G. Boswell		117,430	0	0	0	0	0	117,430
Shell Cal Prod.	3/	85,914	0	0	0	0	0	85,914
Alameda County WD		0	0	6,200	10,000	3,780	16,100	36,080
A.C.F.C. & W.C.D., Zone 7* (Local Supply)		0	0	0	0	5,970	22,910	28,880
Green Valley Water District		11,054	0	0	0	0	0	11,054
Federal Wheeling		1,231,048	9,725	9,206	11,272	14,081	10,476	1,285,808
General Wheeling		0	0	0	0	0	12,804	12,804
Castaic Lake Water Agency		13,579	9,486	14,052	4,870	311	4,086	46,384
M.W.D. Of S.C.		50,092	50,000	95,000	126,486	69,234	138,012	528,824
Santa Clara Valley WD		0	0	45,000	35,000	23,800	30,000	133,800
San Luis Obispo County		0	0	0	1,099	3,592	3,743	8,434
Santa Barbara County		0	0	0	7,439	18,618	20,137	46,194
Central Coastal Water Authority		0	0	86	527	0	0	613
Department of Fish and Game		0	42	0	0	0	0	0
Southern Field Divison								
A.V.E.K. W.A.*		807,207	48,513	57,672	63,729	54,271	70,512	1,101,904
M.W.D. Of S.C*.		14,089,905	386,042	498,380	586,537	363,052	681,605	16,605,521
Littlerock Creek I. D.*		11,829	480	494	444	404	342	13,993
Mojave Water Agency*		97,168	7,495	6,111	12,638	4,580	6,705	134,697
Desert Water Agency*		463,384	38,100	102,622	69,990	70,647	58,100	802,843
Coachilla Valley Water District*		288,391	23,100	62,219	68,340	85,709	50,480	578,239
Crestline-Lake Arrowhead Water Agency*		27,825	884	1,209	1,138	704	1,145	32,905
San Gabriel Valley M.W.D.*		165,428	12,922	15,989	18,175	9,310	21,729	243,553
San Bernardino Valley M.W.D.*		270,316	696	6,064	9,654	1,878	12,874	301,482
Santa Barbara		1,240	0		0	0	0	1,240
Dept. Parks & Rec., L.A. Co. Rec. Dept.		60,457	1,669	2,928	3,624	1,585	3,279	73,542
Piru Creek Fish Enhancement		2,915	0		0	0	0	2,915
Castaic Lake Water Agency*		193,580	17,747	19,704	22,842	19,782	28,813	302,468
Palmdale Water District*		53,548	6,961	11,434	11,861	8,752	13,278	105,834
United Water C.D. (Local Supply)		998	0	0	0	0	0	998
Ventura County FCD*		5,824	0	0	1,850	1,850	1,850	11,374
Los Angeles Dept. of Water and Power		16	1,479	0	0	0	0	1,495
Lilico Pictures		10	0	0	0	0	0	10
Totals		95,256,783	4,069,745	4,850,521	4,668,799	3,768,500	5,316,798	117,931,146

* Long-term contractors

1/ Includes Thermalito Afterbay, Palermo Canal, Upper Feather lakes deliveries.

2/ Hacienda Water District was annexed by Tulare Lake Basin WSD in 1981.

3/ Repayment of preconsolidation water.

4/ Advance storage of ground water, by agreement between KCWA and DWR

5/ Includes 237 AF of Vallejo Permit water transferred to Napa.

- Badger Hill Pumping Plant Units 1, 2, 3, and 4 out of service from January 17 to February 17 to replace motor switchgear.
- Hyatt Powerplant Unit 3 out of service from January 19 to April 13 for annual maintenance.

February

- Thermalito Diversion Dam Powerplant Unit 1 out of service from February 8 to March 5 to install new annunciator.
- Thermalito Pumping-Generating Plant Unit 1 out of service from February 9 to April 16 for annual maintenance.
- Devil Canyon Powerplant Unit 3 out of service from February 16 to March 16 for unit warranty work.
- Las Perillas Pumping Plant Unit 5 out of service from February 19 to March 23 to install new motor switchgear.
- Las Perillas Pumping Plant Unit 6 out of service from February 19 to March 24 to install new motor switchgear.
- Badger Hill Pumping Plant Units 5 and 6 out of service from February 19 to March 23 to install new motor switchgear.

March

- Dos Amigos Pumping Plant Unit 1 out of service from March 1 to April 30 to repair leaking discharge line.
- Edmonston Pumping Plant Unit 12 out of service from March 8 to April 1 to replace circuit breaker.
- Mojave Siphon Powerplant Unit 1 out of service from March 15 to June 11 to install isolation flange on No. 1 line.
- Barker Slough Pumping Plant Units 2 through 9 out of service from March 17 to April 17 to clean Travis Tank.
- Cordelia Pumping Plant Units 1 through 11 out of service from March 17 to April 19 to clean Travis Tank.
- Chrisman Pumping Plant Unit 2 out of service from March 31 to April 23 to replace discharge valve downstream seat “O” ring.

April

- Barker Slough Pumping Plant Unit 1 out of service from April 1 to April 16 to clean Travis Tank.
- Edmonston Pumping Plant Unit 10 out of service from April 5 to April 25 to replace motor breaker.
- Devil Canyon Powerplant Unit 2 out of service from April 5 to April 20 for generator breaker maintenance.
- Pearblossom Pumping Plant Unit 4 out of service from April 5 to July 20 to investigate pump casing leak and repair pump.
- South Bay Pumping Plant Unit 3 out of service from April 9 to April 27 to inspect thrust bearing and repair resistance temperature detector lead.
- Hyatt Powerplant Unit 5 out of service from April 14 to May 19 for annual maintenance.
- Reid Gardner Unit No. 4 Unit out of service from April 30 to May 24 for annual maintenance.

May

- Thermalito Pumping-Generating Plant Unit 4 out of service from May 3 to May 25 for annual maintenance.
- Edmonston Pumping Plant Unit 4 out of service from May 10 to June 24 to retrofit circuit breaker.
- Oso Pumping Plant Unit 3 out of service from May 24 to June 9 to replace leaking discharge valve operating seat "O" ring.

June

- Thermalito Diversion Dam Powerplant Unit 1 out of service from June 2 to June 24 for annual maintenance.

July

- Pearblossom Pumping Plant Unit 9 out of service from July 13 to December 14 to inspect pump mechanical shaft seal and repair pump head cover damage.
- Edmonston Pumping Plant Unit 5 out of service from July 26 for stator rewind. Completion expected in 2000.

August

- Thermalito Diversion Dam Powerplant Unit 1 out of service from August 9 to September 21 to replace interrupter switch.

September

- Cordelia Pumping Plant Unit 1 out of service from September 7 to replace motor power factor capacitor that had failed. Completion expected in 2000.

- Gianelli Pumping-Generating Plant Unit 2 out of service from September 7 to December 17 for biennial maintenance and breaker replacement.
- Edmonston Pumping Plant Unit 8 out of service from September 13 to retrofit unit breaker. Completion expected in 2000.
- Teerink Pumping Plant Unit 8 out of service from September 21 for annual maintenance. Completion expected in 2000.

October

- Hyatt Powerplant Unit 2 out of service from October 4 to November 5 for annual maintenance.
- Thermalito Pumping-Generating Plant Unit 1 out of service from October 4 to November 10 for annual maintenance.
- Gianelli Pumping-Generating Plant Unit 3 out of service from October 6 to October 28 for work on amortisseur.
- Dos Amigos Pumping Plant Unit 1 out of service from October 9 to October 25 to inspect leaking vane control oil head.

November

- Gianelli Pumping-Generating Plant Unit 1 out of service from November 1 to December 7 to replace main breaker.
- Dos Amigos Pumping Plant Unit 2 out of service from November 1 to November 24 for biennial maintenance.
- Chrisman Pumping Plant Unit 4 out of service from November 1 for transformer KYB work. Completion expected in 2000.
- Chrisman Pumping Plant Unit 5 out of service from Unit 5 out of service from November 1 to December 3 for transformer KYB work.
- Devil Canyon Powerplant Unit 3 out of service from Unit 3 out of service from November 3 for annual maintenance. Completion expected in 2000.
- Hyatt Powerplant Unit 4 out of service from November 8 to December 30 for annual maintenance.
- Mojave Siphon Powerplant Unit 1 out of service from November 8 to November 23 for annual maintenance.
- Chrisman Pumping Plant Unit 7 out of service from November 10 to repair motor stator windings. Completion expected in 2000.
- Chrisman Pumping Plant Unit 9 out of service from November 10 to replace impeller. Completion expected in 2000.
- Thermalito Pumping-Generating Plant Unit 2 out of service from November 15 to December 30 for annual maintenance.
- Badger Hill Pumping Plant Units 1, 2, 3, and 4 out of service from November 15 to December 13 to replace discharge valve on Units 1, 2, and 3.
- Pine Flat Powerplant Units 1, 2, and 3 out of service from November 16 to December 9 for plant and switchyard maintenance.
- Teerink Pumping Plant Unit 1 out of service from November 24 to December 22 to repair motor air cooler water supply pipe.
- Edmonston Pumping Plant Unit 9 out of service from November 22 to replace unit breaker. Completion expected in 2000.
- Warne Powerplant Unit 2 out of service from November 29 to December 23 for annual maintenance.
- South Bay Pumping Plant Unit 9 out of service from November 29 to replace motor. Completion expected in 2000.
- Dos Amigos Pumping Plant Unit 1 out of service from November 30 for discharge valve work and oil leak repairs. Completion expected in 2000.

December

- Pine Flat Powerplant Unit 1 out of service from December 14 for annual maintenance. Completion expected in 2000.
- Las Perillas Pumping Plant Units 1, 2, 3, and 4 out of service from December 15 to replace discharge valve on Units 1, 2, and 3. Completion expected in 2000.
- Banks Pumping Plant Units 1, 2, and 3 out of service for repair work on Unit 3 from December 16. Completion expected in 2000.

Water Supply Conditions

The SWP meets its contractual obligations by monitoring precipitation and calculating runoff to coordinate the operation of the complex system of dams and reservoirs. Information on those activities is based on the water supply conditions of the 1999 calendar year and the 1998-99 water year.

Water year 1998-99 was wet in Northern California, but less than the previous very wet year. Surface temperature patterns in the eastern tropical Pacific switched from warmer to cooler than normal-from El Nino to La Nina. California precipitation followed a typical La Nina pattern of dry in Southern California and above normal in the northern part of the State. The north to south gradient in annual precipitation, snowpack, and runoff in the southern Sierra Nevada was one of the steepest in history. Figure 8-1 shows statewide precipitation by hydrologic region. The southern tier was very dry.

Some stations on the Napa and Sacramento Rivers exceeded flood stage briefly on February 7 and February 9. On the whole, water year 1998-99 was a mild year for flood control.

The first part of October 1998 was drier than average, but a significant storm brought rain near the end of the month. Northern Sierra precipitation was about half the monthly average.

November was quite wet, nearly double normal in the northern Sierra. Major weekend storms during the latter half of November brought rains to most portions of the State, but were heavier in the north. December started wet then turned dry with some very cold weather during the last week of the month. It was the coldest winter since the big freeze of December 1990. The extreme cold caused extensive frost damage to San Joaquin Valley citrus.

After a 30-day dry spell, storms resumed in the middle of January 1999. Estimated statewide precipitation for the month was 95 percent of average, with the seasonal accumulation since October 1, 1998, at 85 percent. More storms in February 1999 resulted in 150 percent of average precipitation statewide, ranging from 200 percent in the northern regions to a dry 30 percent in the southeastern regions. This raised the statewide seasonal percentages to average. The February storms caused the highest river stages of the year with significant weir overflow into the Sacramento River bypass system about mid-month. The storms also boosted the snowpack to above average levels.

Precipitation in March was about 80 percent of average statewide. The North Coast and Central Coast had above normal rain but the southern Sierra and Southern California were much below average. The April 1 snowpack was 110 percent overall, but only 60 percent of average in the Tulare Lake region.

Strong shower activity during the first half of April in the coastal and desert regions boosted statewide precipitation to above average (125 percent) for the month. However, normally wetter areas of Northern California had less than average precipitation. The storms were cool and the mountain snowpack continued to increase until near the middle of the month when a week of fair, warm weather began the melting process.

May was dry and cooler than normal. June was also dry in the northern part of the State, but some heavy showers raised precipitation totals in the s May was dry and cooler than normal. June was also dry in the northern part of the State, but some heavy showers raised precipitation totals in the southern half. July and August were near normal overall with unseasonable showers in Southern California during July and some heavy thunderstorms in Northern California during August. Intense lightning on August 22 and 23 started wildfires in Northern California. September was dry (about 25 percent of average precipitation). The water year closed with a statewide estimate of 95 percent of average precipitation. July and August were near normal overall with unseasonable showers in Southern California during July and some heavy thunderstorms in Northern California during August. Intense lightning on August 22 and 23 started wildfires in Northern California. September was dry (about 25 percent of average precipitation). The water year closed with a statewide estimate of 95 percent of average precipitation. Precipitation percentages are used in this report to express historical and regional comparisons. Additional and more specific information is available via the Internet at:

http://cdec.water.ca.gov/snow-rain.html.

Water Operations

Reservoir Operations

Lake Oroville and San Luis Reservoir are the two main conservation facilities for SWP water supplies. Tables 8 and 13 summarize the operations of these reservoirs during the 1999 calendar year.

Lake Oroville began 1999 with 2,692,041 AF of storage, 461,023 more than it held at the beginning of 1998. Storage in Lake Oroville peaked on June 13, 1999 at 3,481,007 AF (98 percent of normal maximum operating capacity) and ended the year at 62 percent of normal capacity or 2,186,332 AF. The net effect of operations and water conditions at Lake Oroville resulted in a decrease in storage of 505,709 AF.

At the beginning of 1999, Lake Del Valle held 24,197 AF (60 percent of normal maximum operating capacity). Highest end-of-month storage was in April at 39,541 AF (99 percent of normal maximum operating capacity). At year's end Lake Del Valle held 28,156 AF (70 percent of normal maximum operating capacity).

At the start of 1999, San Luis Reservoir held 1,897,689 AF, 94 percent of its normal maximum operating capacity (2,027,835 AF); the SWP held 1,074,066 AF, 101 percent of its maximum operating capacity (1,062,183 AF). SWP storage at the end of 1999 decreased to 717,426 AF. End-of-year federal storage was 469,716 AF, for a year-end total of 1,187,142 AF.

SWP southern reservoirs (Pyramid, Castaic, Silverwood, and Perris) have a combined maximum operating storage capacity of 701,320 AF. The total combined storage of, 630,181 AF at the beginning of 1999 decreased to 624,964 AF by the end of the year.

The following tabulation compares normal operating capacity in the principal SWP reservoirs with end-of-year storage for 1998 and 1999:

Reservoir	Normal Maximum Operating Capacity	End-of-year Storage 1998	End-of-year Storage 1999
Lake Oroville	3,537,580	2,687,877	2,186,332
Lake Del Valle	40,000	24,182	28,156
San Luis Reservoir (State Share Only)	1,062,183	1,074,166	717,426
Pyramid Lake	171,200	159,283	159,592
Silverwood Lake	74,970	73,707	69,304
Lake Perris	131,450	124,010	119,833
Castaic Lake	323,700	270,710	276,235
Totals	5,341,083	4,415,933	3,559,011

Water Deliveries and Aqueduct Operations

Generally, water diverted from the Sacramento-San Joaquin Delta is delivered to SWP storage facilities and to contractors through Banks Pumping Plant and Barker Slough Pumping Plant for a variety of beneficial uses. In addition to delivering Table A water to long-term water supply contractors, SWP transports water to other public agencies through exchanges or purchases; provides water for wildlife and recreational uses; and conveys water to meet local water rights agreements. Historical information about water deliveries made to long-term contractors and other agencies through 1999 has been organized in Table 2.

For several years, DWR has offered contractors the opportunity to carry over for delivery during the next year a portion of their Table A water approved for delivery in the current year. The carry-over program was designed to encourage the most effective use of water, and to avoid obligating the contractors to use or lose the water by December 31. Because operational constraints may change from year to year, an agreement in which the conditions of the approval are listed is signed each year with participating contractors. In 1999, SWP delivered 176 AF of Table A water carried over from 1998 to one contractor. Since all the SWP storage facilities were needed for project water, no 1999 carryover water was approved for future delivery.

The Monterey Agreement grew out of water allocation concerns that intensified during the 1987-1992 drought. Rather than negotiate only water allocation issues, the Department and water contractors decided on a major revision to SWP long-term contracts and their administration—in essence, to update management of the SWP. The Monterey Agreement was released to the public December 16, 1994, in the form of 14 principles. *Bulletin 132-95, Chapter 1*, explains the Monterey Agreement in detail.

Make-up water is allocated to contractors according to Article 12(d) and Article 14(b) of the long-term water supply contracts. According to Article 12(d), if for some reason beyond DWR's control, water is not available for delivery according to the established schedule for that year, the water may be delivered at a later date. Article 14(b) of the long-term water supply contracts provides for the delivery of water at a later time if water is not delivered due to necessary investigations, inspections, maintenance, repairs, or replacement of SWP facilities. No make-up water as defined by Article 12(d) or Article 14(b) was delivered in 1999.

Under provisions of their water supply contracts, South Bay and San Joaquin Valley contractors may reduce Table A water deliveries during years in which above-average amounts of local water are available and increase deliveries by an equal amount in later years. No wet-weather credits were given out in 1999.

During 1999, SWP provided water service to 43 agencies, including 27 long-term water contractors. SWP facilities were used to convey non-project water for other agencies, including the CVP. In addition, SWP facilities were used to deliver water transfers, water purchased from the Drought Water Bank, and transfers from one agency to another. Transfers were accomplished according to agreements negotiated with USBR throughout the year and with participants of existing three-party contracts for the use of the Cross Valley Canal, a water conveyance facility that connects with the California Aqueduct in Kern County.

Total Project (State and federal) deliveries for 1999 totaled 5,316,798 AF. This total includes State contract deliveries of 2,965,009 AF, federal deliveries of 1,256,771 AF, Oroville Complex diversions of 1,094,173 AF, 816 AF of Upper Feather River deliveries, and 29 AF of non-chargeable refill water. State contract deliveries include a total of 2,540,616 AF of Table A and Table A-related water to 28 long-term contractors, plus 424,422 AF of other water. A graph showing the historical annual deliveries from SWP facilities is shown in Figure 1. Amounts of 1999 water deliveries are shown by field division on Map 2, and include Table A water, permit water, local supply, recreation, purchases, wheeling, and water transfers. Totals by agency are shown in Table 2.

The following table is a summary of contract deliveries in 1999:

Table A Water		Other Water	
M & I	790,267	Purchase Pool A	78,118
Agricultural	1,066,427	Purchase Pool B	139,090
M GW	194,221	Federal Wheeling	11,083
Bypass	139,171	General Wheeling	14,804
Interruptible	157,894	Local	37,837
Carryover	176	Recreation	4,324
Storage	163,412	Transfer Water	1,439
Transfer	486	Exchange Water	6,729
Exchange	9,000	State transfer to	
Benecia	11,018	Westlands WD	130,969
Vallejo	8,544		
Total	**2,540,616**	**Total**	**424,393**
Total Water		**2,965,009**	

Significant Operational Activities

January

- Peace Valley Pipeline continued to be out of service. Completion of repairs was anticipated to occur in mid-February.
- Repairs of Lower Quail Canal lining were in progress with completion expected in February.
- Work continued on the seepage repairs on the East Branch of the California Aqueduct in Pools 47, 59, and 65. Completion of this work was scheduled for early March....

February

- From February 8 to February 10 the Santa Ana Pipeline was out of service so that a rollout section could be installed in the Box Springs Turnout
- On February 10, DWR increased the 1999 allocation of entitlement water for long-term SWP contractors to 2.44 MAF, or about 60 percent of requested water.
- Panel replacement at Cottonwood Chute was completed on February 26, 1999.
- Repairs to the canal linings were completed at Peace Valley Pipeline and at Lower Quail Canal, and both were ready for use by the end of February.

March

- On March 10, DWR notified SWP contractors that the 1999 Entitlement Allocation was increased to 3.21 MAF. This represents 100 percent of all Table A entitlement requests for 1999.
- East Branch was returned to service on March 5 after scheduled canal lining repairs at Pools 47, 59, and 65 were completed.
- Refill of Silverwood Lake was complete on March 20. Silverwood storage was used to support State Water Contractor demands during scheduled East Branch repairs.
- During March, Oroville total releases to the Feather River were gradually reduced from a high of 20,000 cfs to 3,000 cfs due to decreasing inflow and moderate precipitation.

April

- After last minute changes due to court challenges of the Bureau's implementation of Anadramous Fish Restoration Program actions in the Delta, the SWP and CVP began using the operational objectives in the delta smelt biological opinion as the targets for April 17 to May 16 export pumping. The result was

a combined SWP/CVP export pumping target approximately 3500 cfs less than the flow in the San Joaquin River at Vernalis.

- On April 19, Feather River Service Area contractors began taking deliveries from Thermalito Afterbay. FRSA contractors historically curtail deliveries from Thermalito Afterbay in the winter and resume taking irrigation water in the spring.

May

- At the beginning of May, the CVP and SWP continued to be operated to an export-to-Vernalis flow objective contained in the Delta Smelt Biological Opinion. This objective was applied during the "pulse flow" period, which began April 17; it resulted in a combined export rate that was about 3500 cubic feet per second below the flow rate of the San Joaquin River. On May 13, the Bureau and DWR began operating the CVP and SWP to achieve the export rates of the Vernalis Adaptive Management Plan and associated ramping period. This resulted in a reduction of exports to a combined 3000 cfs. This level remained in effect until May 17, the end of the pulse flow period. Beginning on May 18, the Bureau and DWR began increasing exports to a combined 4,000 cfs. On May 19, the delta smelt "yellow light" salvage concern level was reached. On May 20, the delta smelt "red light" salvage concern level was reached and the Bureau and DWR entered into formal consultation with the USFWS. As a result, combined exports were reduced to 3500 cfs on May 21. On May 25, at the CALFED Operations Group meeting the Bureau and DWR agreed to further reduce combined exports to 3000 cfs through the end of May due to the continued high salvage of delta smelt at the salvage facilities.
- System wide Y2K testing of the aqueduct was completed on May 19, 1999.

June

- Salvage of delta smelt continued to be a problem into early July. The “red light” level of concern for May and June were both exceeded. DWR and the Bureau of Reclamation entered into a reconsultation with the U.S. Fish and Wildlife Service to address the high levels of take. Exports at both Tracy and Banks pumping plants were initially reduced, with Banks export restrictions continuing until the end of June due to higher salvage at the SWP facilities The combined export reductions accumulated to about 500 TAF by the time normal exports were resumed.

July

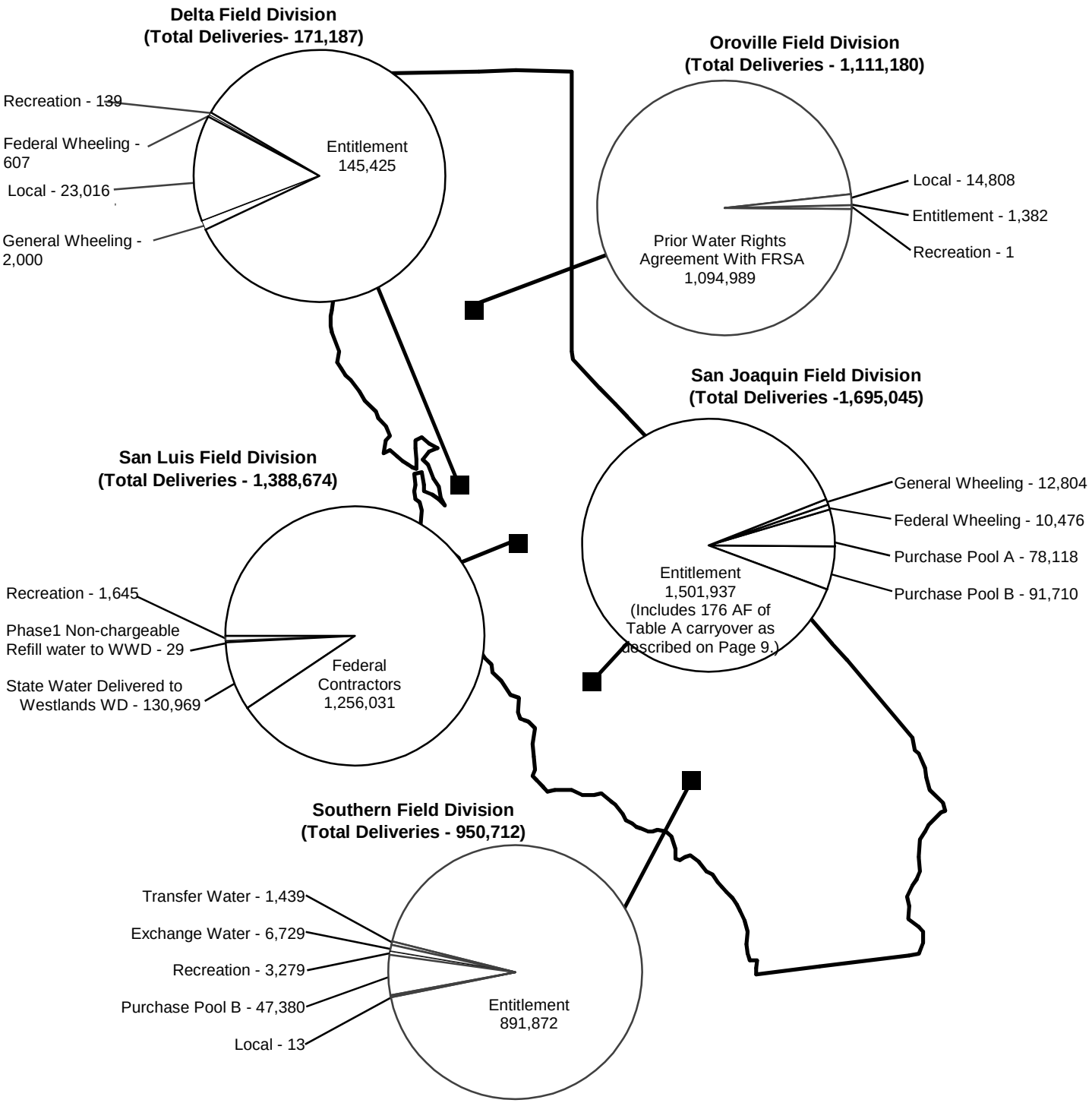
- By July 1, SWP had resumed normal exports after extended curtailment for Delta smelt incidental take.
- On July 26, DWR began removing less desirable fish from Silverwood Lake as part of a court-ordered fishery plan to revitalize the lake’s bass fishery. The plan, developed in coordination with DFG and local bass groups, also includes providing additional habitat improvements and fish stocking in the late summer and fall of 1999. Silverwood Lake’s fishery was adversely affected by the prolonged lowering of the lake for construction of an earthquake-resistant intake tower structure during 1995-1997. It has mandated that the bass fishery be restored to pre-construction levels by 2002.

August

- In August it appeared that La Nina, the cooler eastern tropical Pacific surface condition, would continue into the next winter. The National Weather Service long range forecasts were similar to those of a year ago in predicting above normal precipitation in the northern third of California and in the Pacific Northwest and drier than average conditions in the southern end of California as well as in Arizona and New Mexico.
- The U. S. Army Corps of Engineers authorized SWP to temporarily increase the diversion at Clifton Court Forebay by 500 cfs. This temporary increase was approved through September 30, 1999 and was used to make up pumping curtailments earlier in the year.
- Work on the San Joaquin River riprap project (Sherman Island) was underway after being on hold since last fall. Large riprap used for emergency repairs in winter 1998 was to be removed from the levee, crushed to the proper gradation, and replaced on the levee. The land side work was completed during the summer.
- On August 6, the SWP increased inflow to Clifton Court Forebay above the nominal rate of 6,680 cfs. This increase, approved by the U.S. Army Corps of Engineers, was initiated to begin recovery of the State's share of San Luis Reservoir. From mid-April to the first part of July, the SWP reduced exports by about 324 TAF to protect delta smelt residing in the South Delta. About 112 TAF of that quantity was left upstream in Oroville and will be moved into San Luis Reservoir later in the year. Increasing the diversion rate into Clifton Court Forebay would allow the SWP to place up to 60 TAF of additional project water into San Luis Reservoir. While we expect to fill the State share of San Luis Reservoir, there is a significant probability that delivery of Interruptible Water could be impacted.

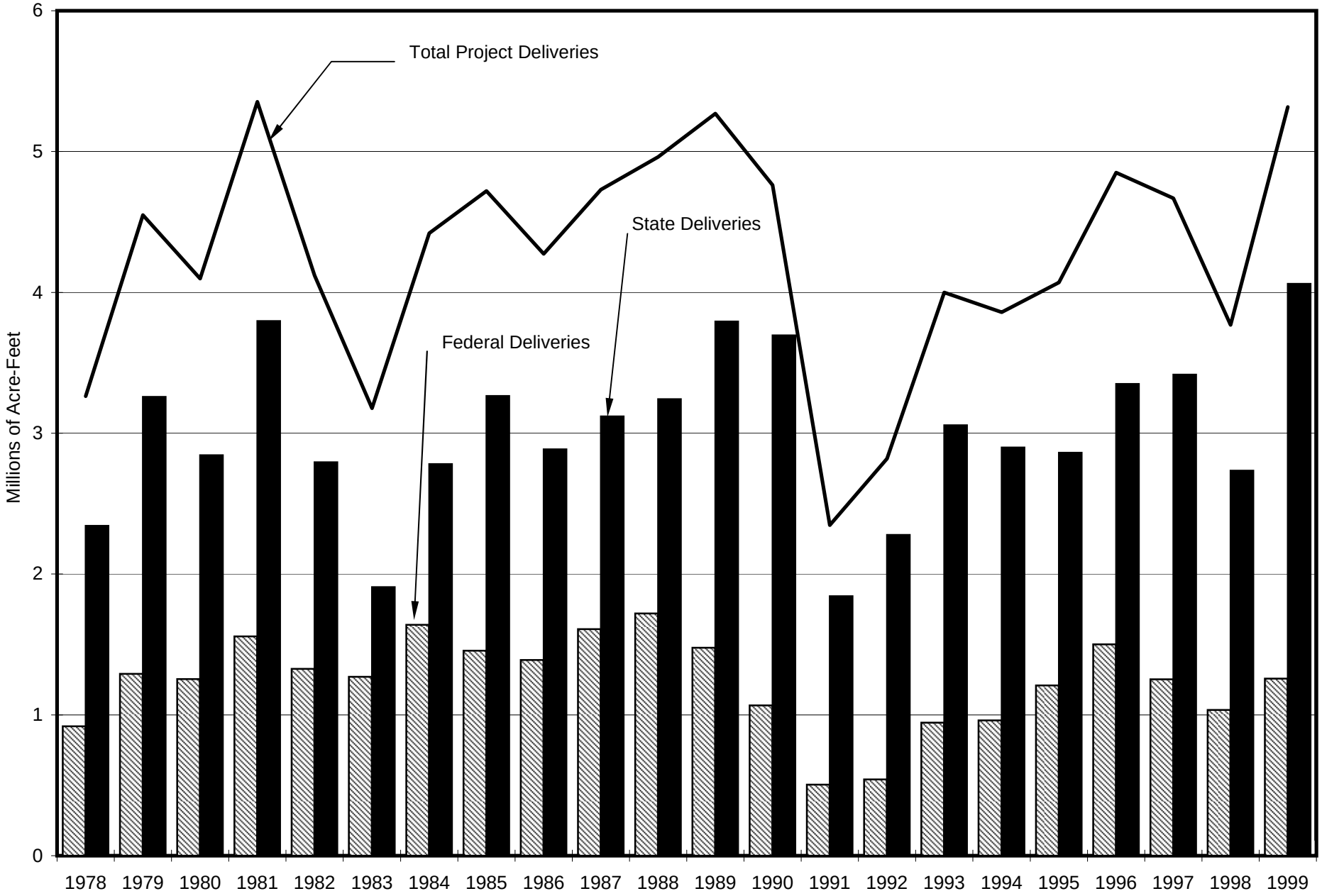
Map 3
1999 Water Deliveries

(in acre-feet)



Total Deliveries
5,316,798

Figure 1. Total Deliveries from SWP Facilities
Annual Totals



September

- On September 22, the SWP ended its increased inflow to Clifton Court Forebay above the nominal rate of 6,680 cfs approved by the U.S. Army Corps of Engineers. The higher 7,180 cfs export level initiated in August resulted in increased exports of approximately 38 TAF to aid in the recovery of impacts resulting from export reductions made in the spring to protect delta smelt.

October

- On October 14, Feather River flows decreased to below 2,500 cfs.
- On October 15, SWP began wheeling federal water to the Cross Valley Canal CVP Contractors.
- Mitten crabs appeared at the State and federal fish facilities in much smaller numbers than expected. An estimated 30,000 were collected at the Skinner Fish Protective Facility during October
- Operations studies conducted early in October projected that State share of San Luis Reservoir would fill by the end of December under average hydrologic conditions and by early January in dry conditions. Filling during that time period is typical, therefore the export reductions made in spring to protect delta smelt are not expected to have a significant water supply impact.

November

- On November 9, excess conditions were declared in the Delta. This declaration was made by mutual agreement with the Bureau when it was evident that runoff being produced by continuing storm events was more than needed to meet Sacramento Valley uses and project exports.
- On November 1, emergency seepage repairs were initiated in Pool 49 and subsequently on November 7 in Pool 54. Pool 49 was repaired and returned to service on November 12. Pool 54 was repaired and returned to service on November 20.
- On November 24, the Data Assessment Team discussed possible closure of the Delta Cross Channel gates because the CALFED Ops Group had developed criteria for closing the gates to protect out-migrating spring-run chinook yearlings. During the DAT discussion, it was concluded that the criteria had not been met and, therefore, no action was recommended. However, on November 26, Department of Fish and Game staff contacted the U.S. Bureau of Reclamation to recommend closing the DCC gates because juvenile salmon were detected moving from the Sacramento River into the Delta. As predicted by operations staff, interior Delta water quality began to degrade as a result of the closure; however, operations staff concluded there shouldn't be a problem meeting the water quality standards because an export curtailment was planned to begin on December 1. The reduction in exports would result in additional outflow, thus improving water quality.

December

- On December 9, balanced conditions were declared in the Delta. Conditions had been in excess since November 9.
- East Branch flow test was successfully performed from December 8, 00:01 hours to December 15, 11:05 hours. The test, requested by the Metropolitan Water District of Southern California, was to verify data taken during last year's flow test and to test operational capability of the East Branch. Target flow of the test was 2,010 cfs at Pearblossom Pumping Plant.
- On November 26, the Delta Cross Channel gates were closed to protect out-migrating spring-run chinook yearlings. The closure, coupled with high exports and low outflow conditions, exacerbated water quality conditions in the interior Delta. Initially, the increasing salinity was not viewed as a major concern because a significant reduction in exports was scheduled to begin shortly after the gates were closed. Unfortunately, the export reduction was delayed; by December 6, interior Delta salinity had reached the recommended level for opening the DCC gates. On December 8, the CALFED Ops Group met and reviewed recommended actions. When the DCC gates were not opened the CVP and SWP reduced exports on December 10 and releases to the Feather River were increased in an effort to improve water quality conditions. Exports were again reduced on December 13 to further improve water quality. Finally, the DCC gates were opened on December 14 and remained that way through the rest of December.
- On December 20, the water quality standard of 250 mg/l chlorides at Contra Costa Pumping Plant #1 was exceeded. CVP and SWP exports remained at 1,600 cfs through December 22. By the end of the month, the CVP and SWP pumping had been ramped up to over 10,000 cfs.

Energy Operations

Energy Resources

SWP energy resources totaled 6,586,833 MWh, as illustrated in Figure 3. This amount includes 4,550,217 MWh of generation from SWP's seven hydroelectric plants (Hyatt, Thermalito, Gianelli, Warne, Castaic, Alamo, Mojave, and Devil Canyon) during 1999, and 146,491 MWh from five small facilities owned and operated by MWDSC (MWD Hydro). DWR has exchange arrangements with Southern California Edison and the Los Angeles Department of Water and Power to provide transmission of this energy.

Since July 1983, DWR has received energy from Reid Gardner Powerplant, a coal-fired facility near Las Vegas, Nevada. Reid Gardner consists of four units. DWR owns 67.8 percent of Unit 4 (169.5 MW based on nameplate capacity of 250 MW), while Nevada Power Company owns the remainder of Unit 4, as well as all of units 1, 2, and 3. The SWP share of energy generated at the coal-fired Reid Gardner Unit 4 during 1999 totaled 1,595,699 MWh of energy.

SWP purchases hydroelectric energy generated by other utilities. The output of the 190 MW Pine Flat Powerplant, owned and operated by the Kings River Conservation District, supplies the SWP about 400,000 MWh of energy in median water years. Pine Flat furnished the SWP 394,426 MWh of energy during 1999.

Combined State energy resources in 1999 totaled 9,989,245 MWh as shown in Figure 4. This includes SCE and other entities combined power received and delivered to the SWP (Net Power Exchange) of 2,171,640 MWh. The DWR-SCE Power Contract has been in effect since April 1983. Under this contract, part of the Hyatt Thermalito Powerplants' generation and all of the output of Devil Canyon Powerplant and Alamo Powerplant are delivered to SCE. The energy is generally delivered during on-peak periods and a greater amount of energy is returned during off-peak periods.

Also included in State energy resources are other purchases totaling 1,230,772 MWh from various utilities and power marketers, such as PacifiCorp and Sacramento Municipal Utility District.

Total energy resources, including 193,707 MWh of Federal energy at Gianelli, came to 10,182,631 MWh as shown in Table 3.

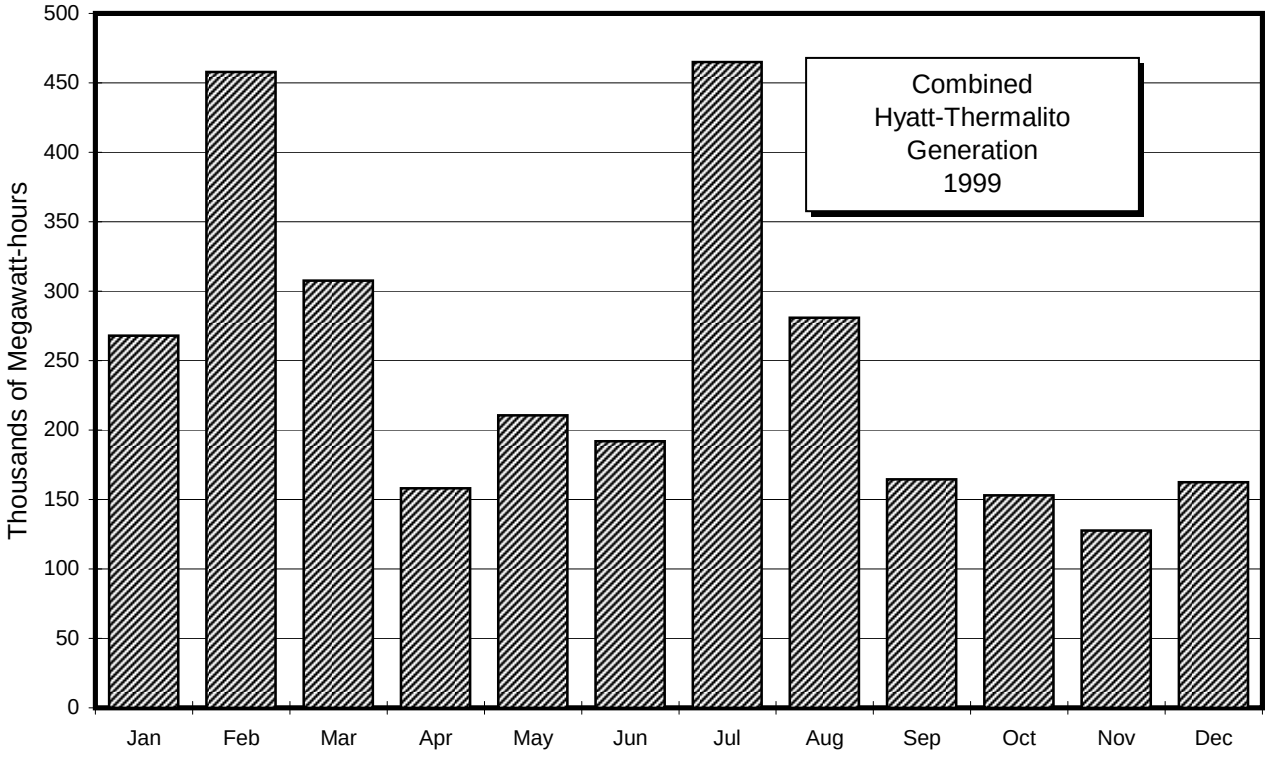
Energy Loads

Energy load data (total energy used by the SWP, including energy to pump Federal water) is summarized in Table 4, and Figures 5 and 6. For the purpose of balancing energy resources and loads, this report itemizes amounts meeting SWP supplies and demands separately from amounts meeting total DWR supplies and demands. Combined State and Federal energy loads in 1999 totaled 10,394,737 MWh. This includes SWP energy loads of 5,480,631 MWh, as shown in Table 4 and itemized in Figure 5. Also included are sales of 4,231,720 MWh, and deviation adjustment of 276,894 MWh, for a total load of 9,989,245 MWh as itemized in Table 4 and shown in Figure 6.

The San Joaquin Field Division, which includes the only stretch of Aqueduct with no reservoirs, accounted for over half of the total project energy load, 3,577,347 MWh. Included in this amount are 2,269,898 MWh used at Edmonston Pumping Plant with peak pumping occurring in October using 308,990 MWh of energy.

In 1999, the Department sold power to 27 utilities and 13 power marketers, resulting in revenues of over $104.5 million. The largest sale was 1,195,316 MWh to California Power Exchange. The Department also received $22.36 million for capacity, exchange, and transmission arrangement, including $18.91 million for transactions made through ISO.

Figure 2. Combined Operation of Hyatt-Thermalito Powerplants



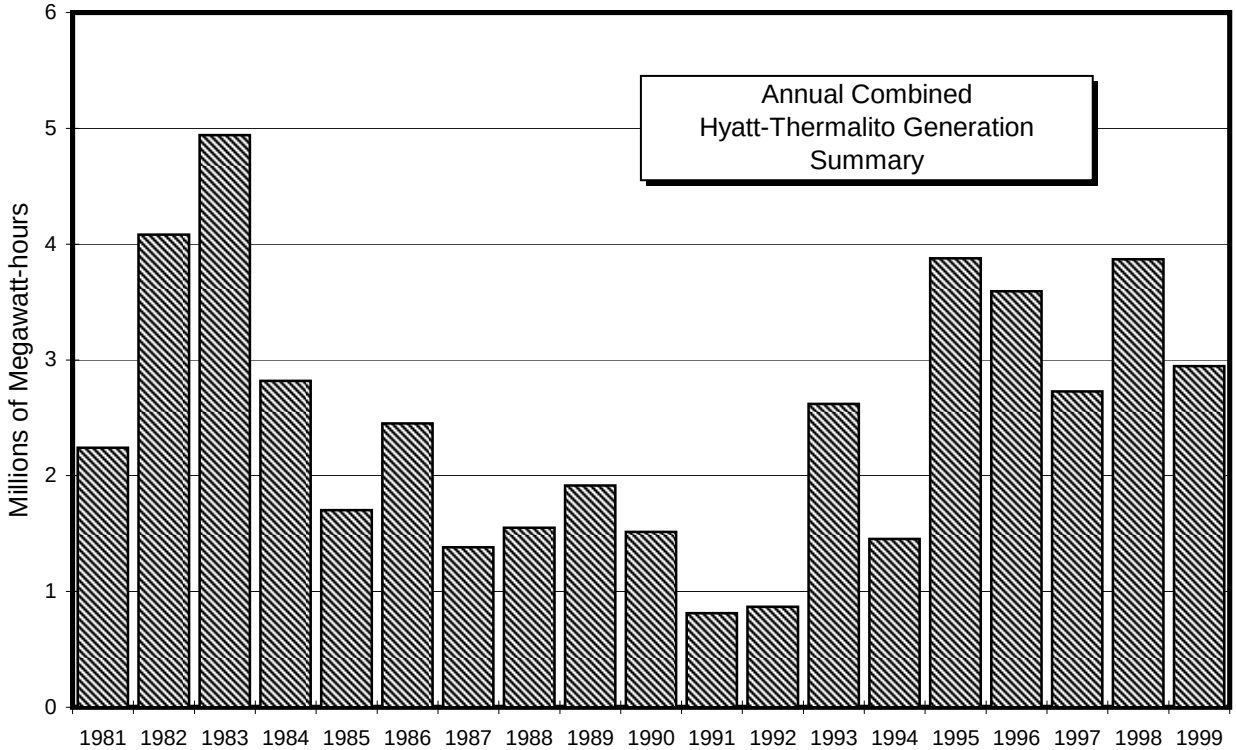
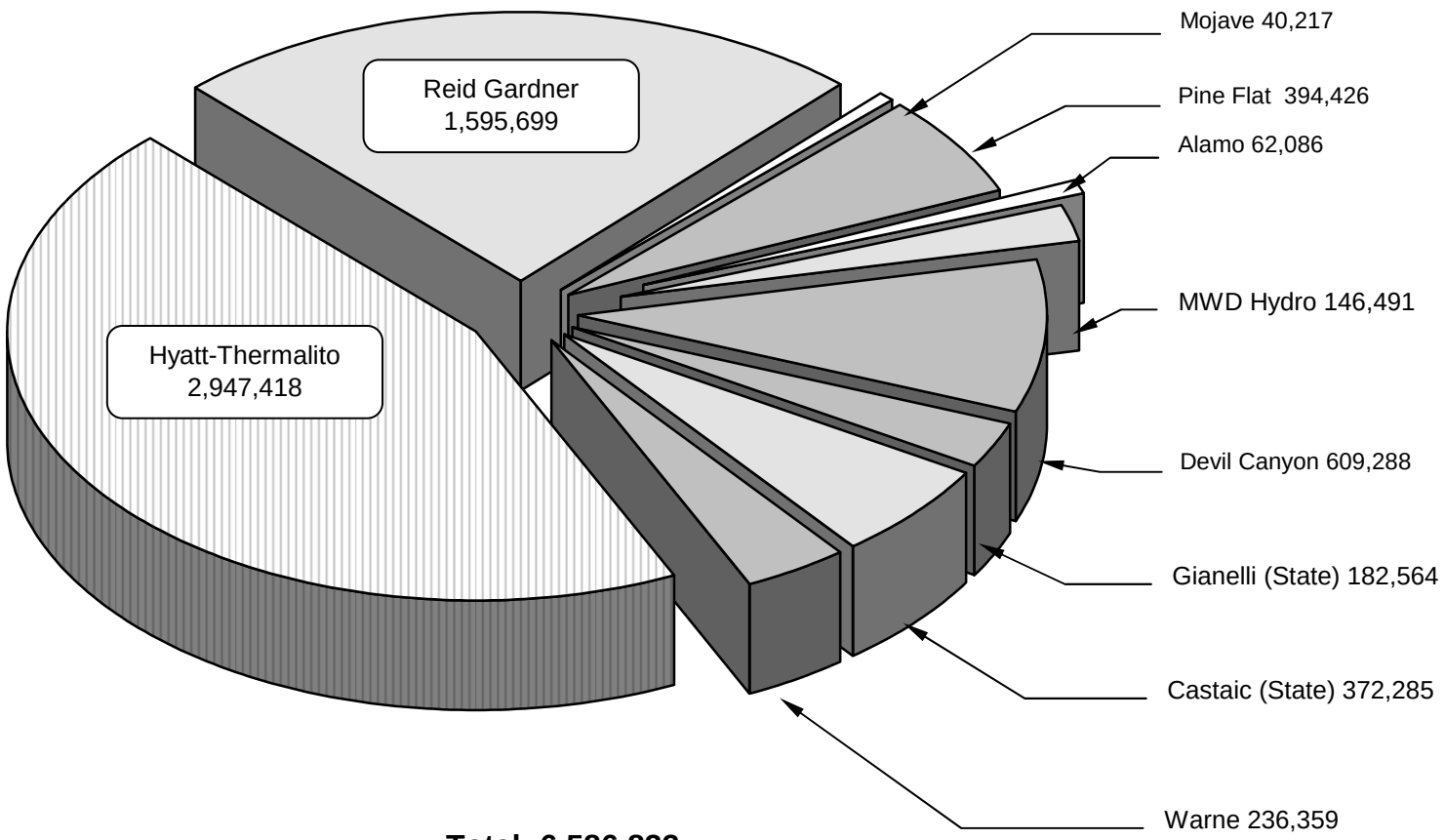


Figure 3. SWP Energy Resources

(all values in MWh)

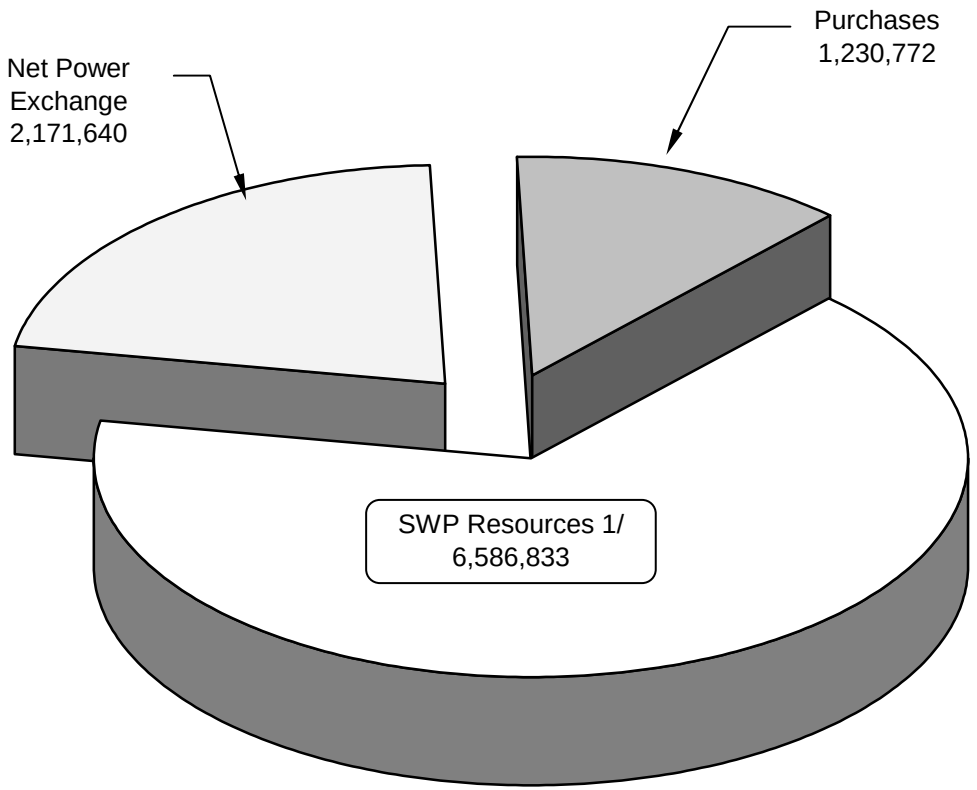
1999



Total: 6,586,833

Note: Purchases, Other Sources, and SCE Return Additional are not shown here. All values are metered readings at plants and are not adjusted for transmission losses.

Figure 4. Total Energy Resources
1999
(All values in MWh)



Total: 9,989,245

1/ See Figure 3 for a breakdown of SWP Energy Resources.

Purchases

PacifiCorp	614,418
Duke/Louis Dreyfuss, LLC	350,429
California Power Exchange	101,951
Sempra Energy Trading, Inc.	82,500
Powerex	29,600
Bonneville Power Administration	26,740
Pacific Gas & Electric Energy Trading	8,400
Puget Sound Energy	5,700
MIECO, INC.	4,925
Seattle City Light	2,400
Portland General Electric	1,600
Sacramento Municipal Utility District	900
Modesto Irrigation District	633
City & County of San Francisco	360
Williams Energy Services Company	216
	1,230,772

Power Exchange Summary

Power Exchange Received from SCE	4,446,542
Power Exchange received from other entinities.	656,803
Power Exchange delivered to SCE.	-2,275,190
Power Exchange delivered to other entinities.	-656,761
Power System Imbalances	246
Net Power Exchange	2,171,640

Table 3. Total Energy Resources
1999

(in megawatt-hours)

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt-Thermalito 1/	268,034	457,775	307,517	157,986	210,662	191,981	465,021	280,865	164,538	152,924	127,640	162,475	2,947,418
Gianelli													
State	629	455	8,625	14,448	37,751	66,801	16,558	15,049	296	11,001	1,548	9,403	182,564
Federal	9,664	0	0	16,064	64,252	50,630	40,999	9,488	0	0	0	2,610	193,707
Total	10,293	455	8,625	30,512	102,003	117,431	57,557	24,537	296	11,001	1,548	12,013	376,271
Warne 2/	0	24	38,755	32,307	10,360	6,663	15,047	20,529	19,346	30,260	37,156	25,912	236,359
Castaic	432	0	56,160	45,040	15,944	9,600	23,656	32,520	29,400	49,853	65,040	44,640	372,285
Mojave	117	0	3,243	2,769	2,675	3,766	5,262	4,777	4,716	5,539	892	6,461	40,217
Alamo	436	0	5,639	4,681	5,123	6,414	7,590	7,402	7,631	9,084	1,547	6,539	62,086
Devil Canyon	18,266	5,991	33,623	41,835	43,930	55,376	75,725	74,840	69,020	84,935	40,868	64,879	609,288
MWD Hydro	8,249	8,365	9,131	12,880	10,310	11,878	14,805	14,922	14,040	13,755	12,767	15,389	146,491
Reid Gardner	142,363	114,744	135,973	163,116	22,241	113,335	145,007	138,852	170,146	150,882	155,265	143,775	1,595,699
Pine Flat	2,255	174	18,949	22,192	68,531	110,170	107,421	48,745	14,751	1,238	0	0	394,426
Net Power Exch.	55,585	-32,685	138,654	207,803	42,644	-2,628	34,703	264,444	331,347	305,822	371,946	453,759	2,171,394
Purchases 3/	49,200	48,000	72,888	81,480	90,000	136,000	98,400	92,774	98,894	109,414	111,390	242,332	1,230,772
Power System Imbalances	-207	690	0	-578	0	4	0	16	0	0	0	321	246

1/ Includes Table Mountain and Hyatt out adjusted to Tesla.

2/ Includes station-service energy.

3/ Includes PacifiCorp, Duke/Louis Dreyfuss, LLC, California Power Exchange, Sempra Energy Trading, Inc., Powerex, Bonneville Power Administration, BG&E Energy Trading, Puget Sound Energy, MIECO. INC, Seattle City Light, Portland General Electric, Sacramento Municipal Utility District, Modest Irrigation District. City & County of San Francisco, and Williams Energy Services Co.

Total State:	9,989,245
Total Federal:	193,707
Total Energy Resources:	10,182,952

Table 4. Total Energy Loads

1999

(in megawatt hours)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt-Thermalito 1/	64	4	21	8	22	287	0	188	27,302	796	8,158	8,213	45,063
North Bay 2/	1,434	806	527	363	1,197	1,479	2,131	2,017	1,625	1,759	1,533	1,766	16,637
South Bay	4,923	4,785	3,355	3,659	5,636	8,702	12,532	13,731	12,886	9,506	5,722	9,546	94,983
Del Valle	30	101	7	7	8	11	17	11	10	29	7	104	342
Banks													
State	24,517	10,299	51,726	52,528	28,117	17,678	107,925	116,998	116,204	83,568	85,644	67,312	762,516
Federal	0	4,835	0	0	0	0	0	0	0	0	0	0	4,835
Bottle Rock 3/	59	53	57	49	44	34	37	33	32	28	34	44	504
Gianelli													
State	15,628	-178	5	1,258	93	47	3,547	16,056	34,128	11,525	35,280	25,203	142,592
Federal	21,129	32,149	43,834	2,193	0	0	0	2,895	13,848	35,021	47,942	30,391	229,402
Dos Amigos													
State	5,816	4,768	29,188	30,438	31,785	49,001	59,532	55,366	33,279	40,755	25,390	23,582	388,900
Federal	15,785	14,959	11,397	9,246	22,509	30,888	35,025	16,722	5,343	1,926	2,184	5,592	171,576
Pine Flat 3/	176	226	0	0	0	0	0	0	0	87	1	193	683
Las Perillas	285	412	621	744	1,099	1,546	1,701	1,299	777	574	218	319	9,595
Badger Hill	741	1,112	1,691	2,035	3,070	4,242	4,626	3,657	2,199	1,544	557	759	26,233
Devil's Den	879	827	1,071	1,109	1,737	1,680	2,164	1,978	1,913	1,698	988	1,161	17,205
Bluestone	924	857	1,092	1,152	1,798	1,739	2,229	2,016	1,806	1,602	934	1,091	17,240
Polonio	898	845	1,082	1,129	1,762	1,705	2,189	2,001	1,936	1,724	1,005	1,184	17,460
Buena Vista	2,605	2,677	30,374	25,885	20,338	24,761	33,395	31,883	27,828	35,673	19,751	30,499	285,669
Teerink	1,579	1,175	31,250	26,873	19,067	22,062	31,426	31,128	29,257	38,378	21,537	33,280	287,012
Chrisman	3,551	2,504	71,659	61,505	41,221	47,088	68,611	69,537	66,658	87,611	49,522	77,568	647,035
Edmonston	10,020	7,195	256,015	218,726	141,398	159,864	237,167	243,317	232,834	308,990	176,248	278,124	2,269,898
Oso	282	497	17,478	14,775	4,818	3,092	6,653	9,051	8,527	13,951	16,992	11,680	107,796
Mojave 3/	83	82	29	29	32	14	2	0	0	1	54	2	328
Pearblossom	2,017	498	28,025	23,497	22,503	31,371	43,471	40,065	39,837	49,516	7,380	50,847	339,027
Warne 3/	136	124	149	147	443	478	236	99	0	16	23	23	1,874
Alamo 3/	65	75	18	14	27	27	27	24	22	15	47	24	385
Devil Canyon 3/	314	192	180	178	150	94	94	94	94	92	103	69	1,654
Sales 4/	453,364	554,586	282,189	310,492	220,977	317,580	363,041	325,955	263,438	222,703	458,304	459,091	4,231,720
Actual Deviation	14,968	2,853	21,347	9,360	14,807	14,777	26,441	32,474	21,534	12,567	9,746	96,020	276,894

1/ Pumpback and Station Service

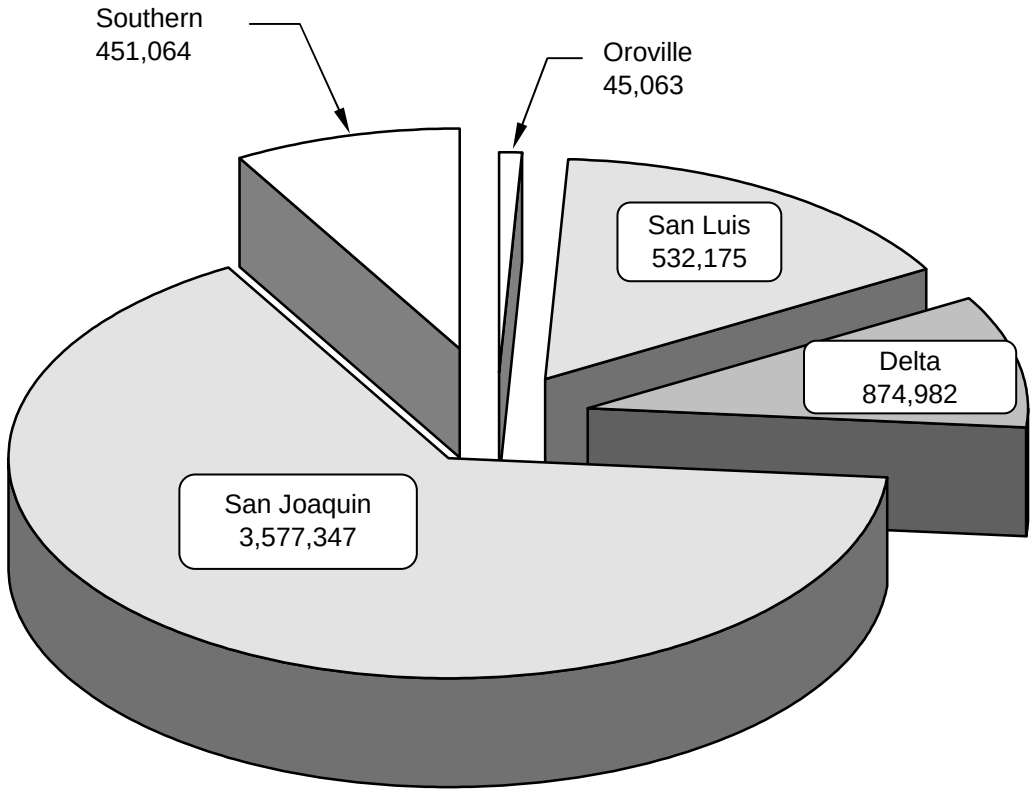
2/ Includes Barker Slough, Cordelia, and Cordelia Interim Pumping Plants.

3/ Station Service only.

4/ See Figure 6 for the list of entities to whom energy was sold in 1999.

Total State:	9,989,245
Total Federal:	405,813
Total Loads:	10,395,058

Figure 5. SWP Energy Loads
1999
(all values in MWh)



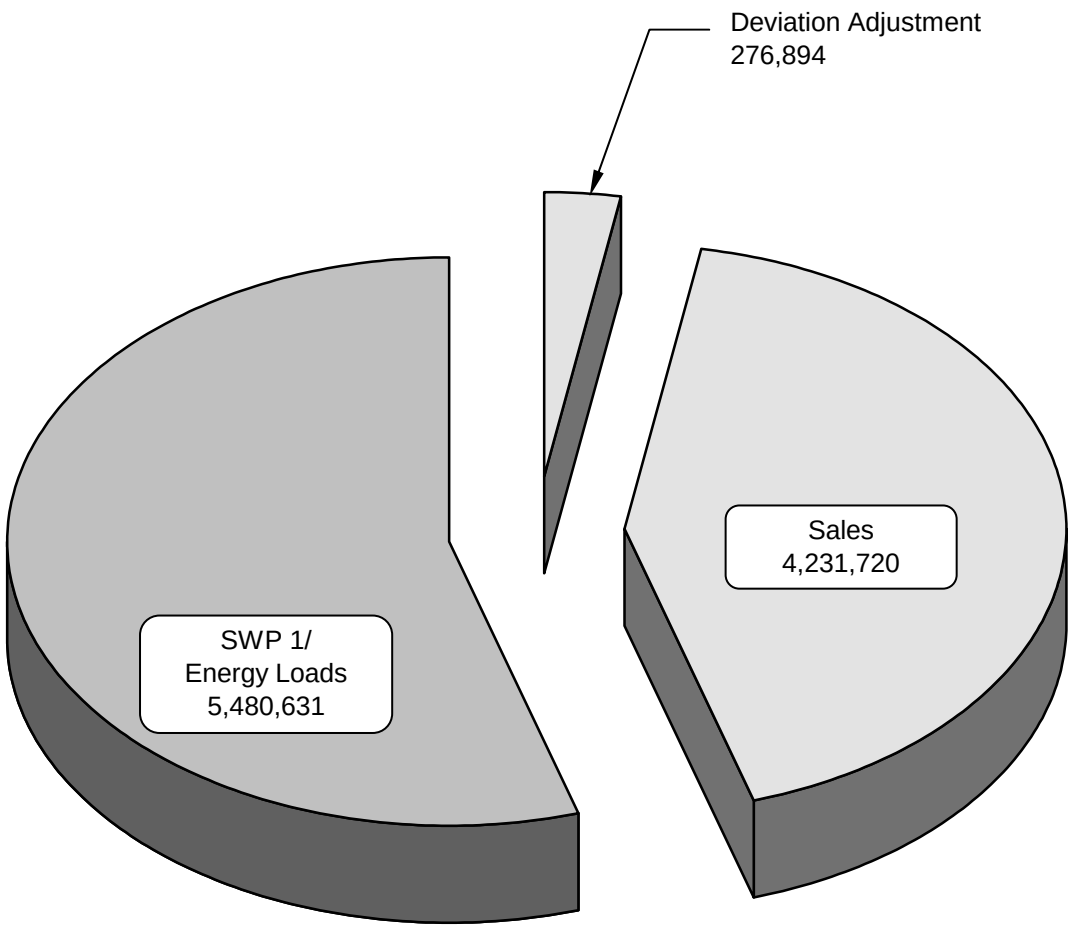
Total: 5,480,631

Oroville Field Division	
Hyatt-Thermalito Complex (Pumpback and Station Service)	45,063
	45,063
Delta Field Division	
North Bay	16,637
South Bay	94,983
Del Valle	342
Banks	762,516
Bottle Rock (Station Service)	504
	874,982
San Luis Field Division	
Gianelli	142,592
Dos Amigos	388,900
Pine Flat (Station Service)	683
	532,175
San Joaquin Field Division	
Las Perillas	9,596
Badger Hill	26,232
Devil's Den	17205
Bluestone	17240
Polonio	17460
Buena Vista	285,669
Teerink	287,012
Chrisman	647,035
Edmonston	2,269,898
	3,577,347
Southern Field Division	
Oso	107,796
Mojave (Station Service)	328
Devil Canyon (Station Service)	1,654
Alamo (Station Service)	385
Pearblossom	339,027
Warne (Station Service)	1,874
	451,064

Figure 6. Total Energy Loads

1999

(all values in MWh)



Total: 9,989,245

1/ See Figure 5 for breakdown of SWP Energy Loads.

Sales	
California Power Exchange	1,195,316
Duke Energy Trading and Marketing	601,120
PGE Energy Trading	323,000
Nevada Power Company	452,304
Sacramento Municipal Utility Dist.	282,825
Sempra Energy Trading Corp	208,649
Arizona Public Service	150,008
Northern California Power Agency	118,419
City and County of San Francisco	116,216
City of Vernon	114,264
City of Riverside	101,454
Los Angeles Dept. of Water & Power	87,156
Salt River Project	55,465
Aquila Power Corporation	54,987
PGE Energy Service	51,600
Modesto Irrigation District	42,453
PacifiCorp	42,094
Enron Power Marketing	37,823
Puget Sound Power & Light Company	33,057
City of Glendale	30,930
City of Azusa	26,123
Williams Energy Service Corp	18,832
New Energy Ventures	15,200
Metropolitan Water Dist of So Cal	13,572
City of Pasadena	12,609
Mieco	9,700
Portland General Electric Company	9,170
Western Area Power Admin	5,280
City of Redding	5,150
Turlock Irrigation District	3,547
Lassen Municipal Utility Dist	3,160
Seattle City Light	2,513
Illinova Power Marketing, Inc.	2,500
Idaho Power Company	2,341
City of Santa Clara	1,357
San Diego Gas & Electric Company	550
No AM Energy Servise	500
San Berardino Valley MWD	321
Bonneville Power Administration	80
Electric Clearing House	75
	4,231,720

Sacramento - San Joaquin Delta Operations

The Sacramento-San Joaquin Delta provides an estimated one-half of the State's water supply. In addition, the Delta is an estuary, a constantly changing area where tidal and river currents meet, and where salinity is between the extremes of brackish and fresh waters. The estuary provides habitat for fish and wildlife, including waterfowl on the Pacific Flyway.

Many of the problems facing the Delta today, such as saltwater intrusion and oxidation of peat soil, have plagued the area for many years. Originally a tidal marshland covered with tulles, the Delta, during dry summer months, has been subject to intrusions of salty ocean water from the San Francisco Bay.

Today, dams upstream of the Delta, including SWP's Oroville Dam and CVP's Shasta Dam, help control the intrusion of salt water by releasing fresh water into the Delta during dry periods in summertime. However, problems with salinity in the Delta still exist

With assistance from urban, agricultural, and environmental interests, and other stakeholders concerned with Bay-Delta issues, State and federal agencies developed the Bay Delta Accord. The Accord grew out of Governor Wilson's 1992 policy to "fix the Delta." This led to events that shaped the State-Federal Framework Agreement, signed in June 1994, and the Bay-Delta Accord signed December 15, 1994. *Bulletin 132*-95, *Chapter 1*, explains both the State-Federal Framework Agreement and the Bay-Delta Accord in detail.

Net Delta Outflow Index

Delta outflow is not measured directly due to the major tidal influence in the Delta. Instead an index of Delta outflow is calculated using measured inflows, exports, and estimated in-Delta water use. A new method of calculating Delta outflow was introduced in the 1995 Principles for Agreement on Bay-Delta Standards. This new index, the Net Delta Outflow Index, considers inflows of the Yolo Bypass system, the eastside stream system (the Mokelomne, Cosumnes, and Calaveras rivers), San Joaquin River at Vernalis, and Sacramento Regional Wastewater Treatment Plant. Major Delta exports and the estimated in-Delta water use are deducted from the cumulative inflow total to produce the index. The NDOI became effective for use in Delta standards compliance on January 1, 1995. Table 5 shows the computed daily NDOI for 1999.

The NDOI calculated flows cannot be directly compared to the prior Delta Outflow Index, as the Sacramento River bypass flows and several eastside stream flows were not included in the earlier DOI calculations. Those flows can be quite substantial during high flow periods. In 1999, the Yolo Bypass flows of about 2.9 MAF contributed 22 percent of total Delta inflow of about 13.1 MAF and, during the extremely high flow of 3.7 MAF in March, contributed over 60 percent (about 2.2 MAF) of inflow. A comparison of Delta Inflow and NDOI is plotted on Figure 7. Gross channel depletion is the sum of evapotranspiration and net increase in soil moisture of Delta lands plus evaporation from Delta channels.

The 1999 daily NDOI averaged 27,065 cfs for the year and was 40,178 cfs less than the 1998 daily average. The greatest average monthly NDOI occurred in February at 105,538 cfs and the greatest average daily was 158,255 cfs on February 22. The lowest average monthly NDOI occurred in October (4,318 cfs) and the year's lowest average daily NDOI was on August 21 with 1,975 cfs.

D-1485 standards set a minimum NDOI at Chipps Island for adequate water for fisheries. All NDOI and river flow standards were met in 1999.

Table 5. Net Delta Outflow Index
1999

(in cfs-days except as noted)

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	23,029	56,999	98,678	42,848	29,409	19,914	9,685	12,198	5,560	4,797	7,337	6,925
2	22,260	52,585	102,611	37,617	29,111	19,137	11,487	12,585	5,528	4,460	6,865	7,597
3	21,749	48,404	110,551	32,138	29,580	17,514	10,105	12,907	4,366	4,223	4,409	9,057
4	22,452	43,890	115,398	30,660	29,835	17,605	9,811	12,289	4,207	4,364	4,201	10,937
5	22,386	40,781	118,043	28,026	30,958	17,535	10,094	10,353	4,371	4,633	4,242	10,617
6	21,479	35,838	114,817	31,498	29,849	18,385	9,155	8,779	4,548	3,878	4,771	7,676
7	20,847	40,279	111,494	30,839	29,229	18,918	9,534	8,581	4,282	3,994	4,633	7,156
8	20,565	64,273	106,117	31,010	28,590	19,066	9,754	7,862	4,329	4,208	6,448	6,796
9	20,152	77,058	99,123	31,816	25,466	18,302	9,507	6,990	4,391	4,267	5,837	6,485
10	19,310	117,621	99,608	32,074	25,392	16,807	9,962	6,500	4,267	4,391	5,815	12,931
11	18,552	154,033	88,714	29,764	26,269	16,359	9,848	5,240	4,368	4,418	7,222	14,102
12	18,172	156,950	87,290	33,007	24,246	14,386	10,262	4,786	5,214	6,554	7,406	14,848
13	16,363	146,964	80,338	37,631	23,101	14,043	9,932	4,525	5,218	4,722	4,565	17,625
14	13,367	128,079	73,607	40,757	23,357	13,649	10,045	4,748	4,664	3,507	5,490	17,481
15	13,443	111,077	70,518	40,464	23,023	13,775	9,844	7,236	3,692	2,215	5,653	16,261
16	16,446	101,651	68,211	36,509	22,953	12,970	11,462	5,308	3,713	2,215	7,831	16,266
17	16,790	98,046	65,883	38,922	21,956	12,919	11,591	4,147	3,797	2,771	7,612	15,993
18	17,950	113,407	62,729	38,882	20,112	12,700	11,479	3,616	3,354	4,380	7,703	15,666
19	24,207	146,100	57,900	40,518	18,011	12,588	11,043	2,667	4,441	4,577	6,967	15,203
20	33,263	153,741	54,615	40,070	17,369	12,471	11,245	2,640	4,898	4,109	8,820	14,433
21	45,713	156,797	49,196	39,021	17,915	11,915	11,612	1,975	5,675	4,178	10,326	13,038
22	66,334	158,255	47,589	38,740	17,782	11,369	11,651	2,270	4,895	4,140	8,915	11,549
23	71,379	156,427	44,047	38,270	17,348	10,972	11,589	3,858	4,479	3,457	9,194	10,548
24	72,126	147,866	40,569	35,992	17,837	10,219	11,080	4,078	4,779	3,841	9,818	9,120
25	72,627	130,500	40,238	34,541	18,889	10,680	11,262	3,884	4,425	4,210	7,199	8,533
26	72,383	112,682	42,705	33,091	18,920	8,457	11,236	4,102	4,248	4,117	5,841	7,535
27	72,260	104,134	44,515	31,915	18,584	8,909	11,546	4,229	4,463	4,207	4,939	7,538
28	70,006	100,618	48,478	31,458	18,448	8,809	12,432	4,358	4,148	4,362	4,951	7,075
29	65,167		49,151	31,066	18,319	10,079	12,925	6,060	4,473	5,497	4,950	6,132
30	60,841		48,782	30,696	19,635	11,701	12,347	5,825	4,881	6,321	5,222	5,833
31	56,027		46,060		19,540		11,814	5,809		6,844		4,146
Total	1,127,645	2,955,055	2,287,575	1,049,840	711,033	422,153	335,339	190,405	135,674	133,857	195,182	335,102
Ave.	36,376	105,538	73,793	34,995	22,937	14,072	10,817	6,142	4,522	4,318	6,506	10,810
Max.	72,627	158,255	118,043	42,848	30,958	19,914	12,925	12,907	5,675	6,844	10,326	17,625
Min.	13,367	35,838	40,238	28,026	17,348	8,457	9,155	1,975	3,354	2,215	4,201	4,146
Total In AF	2,236,684	5,861,352	4,537,405	2,082,358	1,410,334	837,340	665,145	377,668	269,109	265,505	387,143	664,675

Annual Total = 19,594,718 acre-feet

Table 6. Sacramento Basin and Sacramento-San Joaquin Delta Operations
1999

(in thousands of acre-feet except as noted)

Month	Upstream Reservoir Releases to River			Sacramento River Accretions or Depletions 2/	Delta Inflow				Net Delta Consumptive Use	Delta Exports					Net Delta Outflow Index
	Keswick 1/	Oroville 1/	Nimbus		Sacramento River at Sacramento 3/	Miscellaneous Inflows 4/	San Joaquin River at Vernalis	Total Inflow		Clifton Court Forebay Intake	Barker Slough Pumping Plant	Tracy Pumping Plant	Contra Costa Pumping Plant	Total Exports	
Jan	463	374	377	853	2,086	122	262	2,470	-50	87	3	183	10	283	2,237
Feb	946	887	728	2,320	3,698	1,670	600	5,968	-190	52	1	240	4	297	5,861
Mar	1,236	623	370	1,911	3,575	907	524	5,006	26	181	1	252	8	442	4,538
Apr	443	229	253	930	1,858	201	366	2,425	51	185	1	101	5	292	2,082
May	625	195	266	157	1,236	163	357	1,756	133	101	3	105	4	213	1,410
Jun	668	125	236	-5	1,033	116	189	1,338	217	67	4	198	15	284	837
Jul	811	531	262	-238	1,372	95	136	1,603	260	386	7	272	13	678	665
Aug	671	333	153	-21	1,128	63	119	1,310	227	411	6	270	18	705	378
Sep	498	195	123	144	957	29	118	1,104	154	414	5	254	8	681	269
Oct	384	195	147	58	781	25	148	954	108	307	6	261	6	580	266
Nov	370	146	133	182	831	21	133	985	31	308	4	250	5	567	387
Dec	427	187	146	272	1,035	21	108	1,164	105	232	4	156	2	394	665
Total	7,542	4,020	3,194	6,563	19,590	3,433	3,060	26,083	1,072	2,731	45	2,542	98	5,416	19,595

1/ Time lagged values (Keswick: 5 days; Oroville: 2 days).

2/ Positive values are accretions; negative values are depletions.

3/ These values are based on a measured daily average taken from the Sacramento River at Freeport and include Sacramento County Regional Waste Treatment Plant.

4/ Includes Yolo Bypass, Eastside Streams, and Miscellaneous Inflows.

Figure 7. Delta Tide, Inflow, and Net Delta Outflow Index
1999

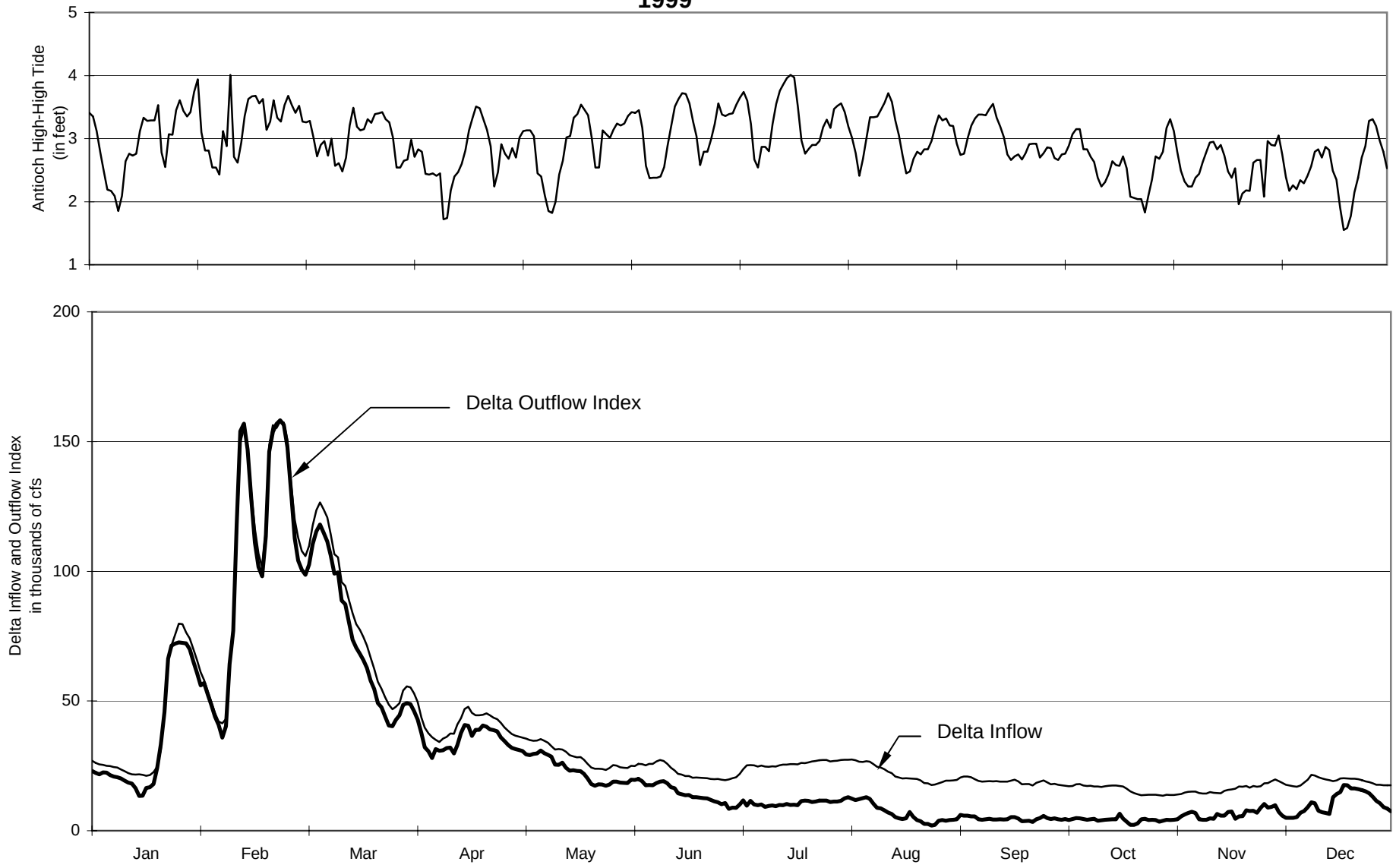
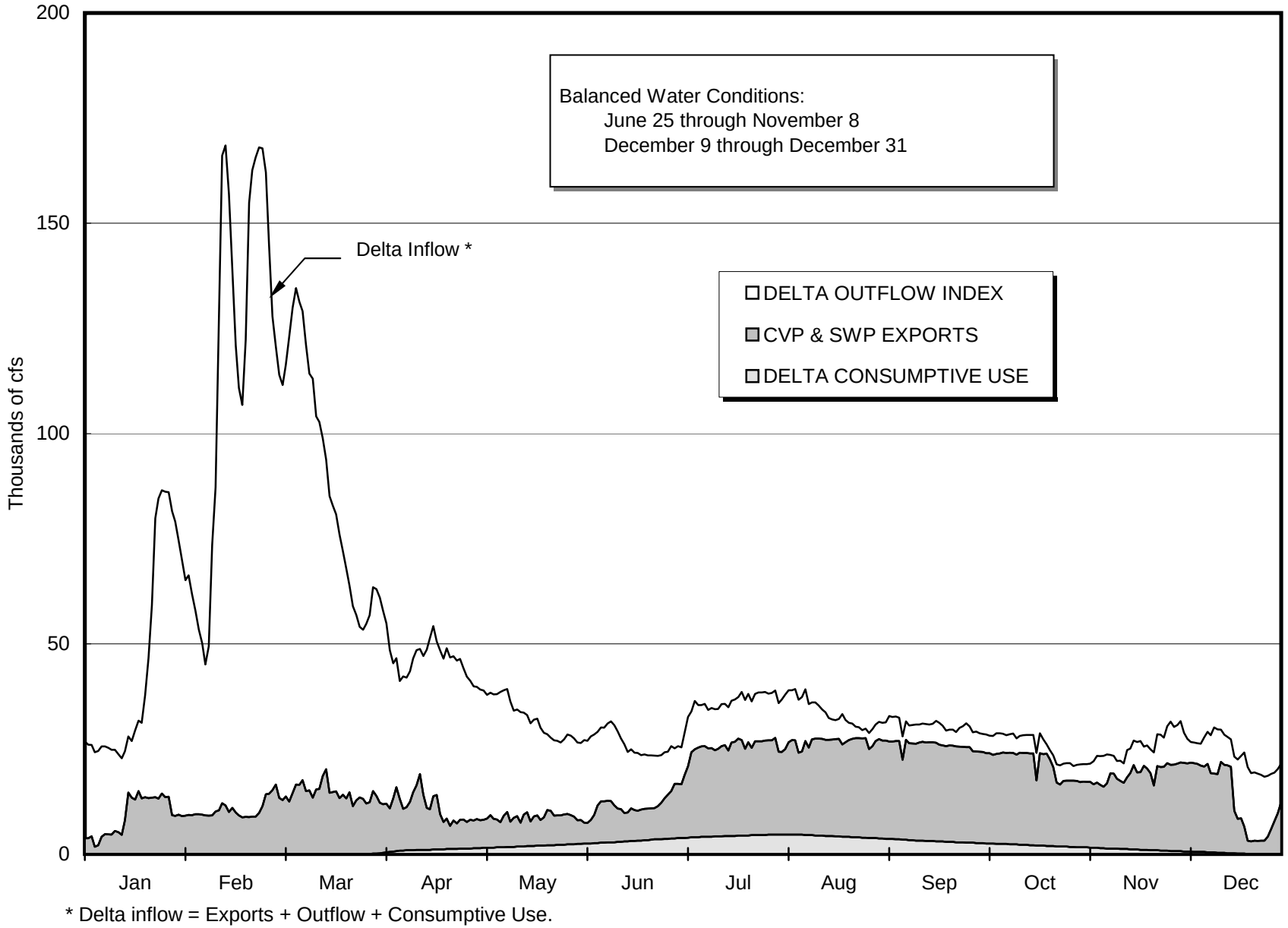


Figure 8. Coordinated Delta Operations
1999



* Delta inflow = Exports + Outflow + Consumptive Use.

Figure 9. Coordinated Delta Operations
Lagged Storage Withdrawals
1999

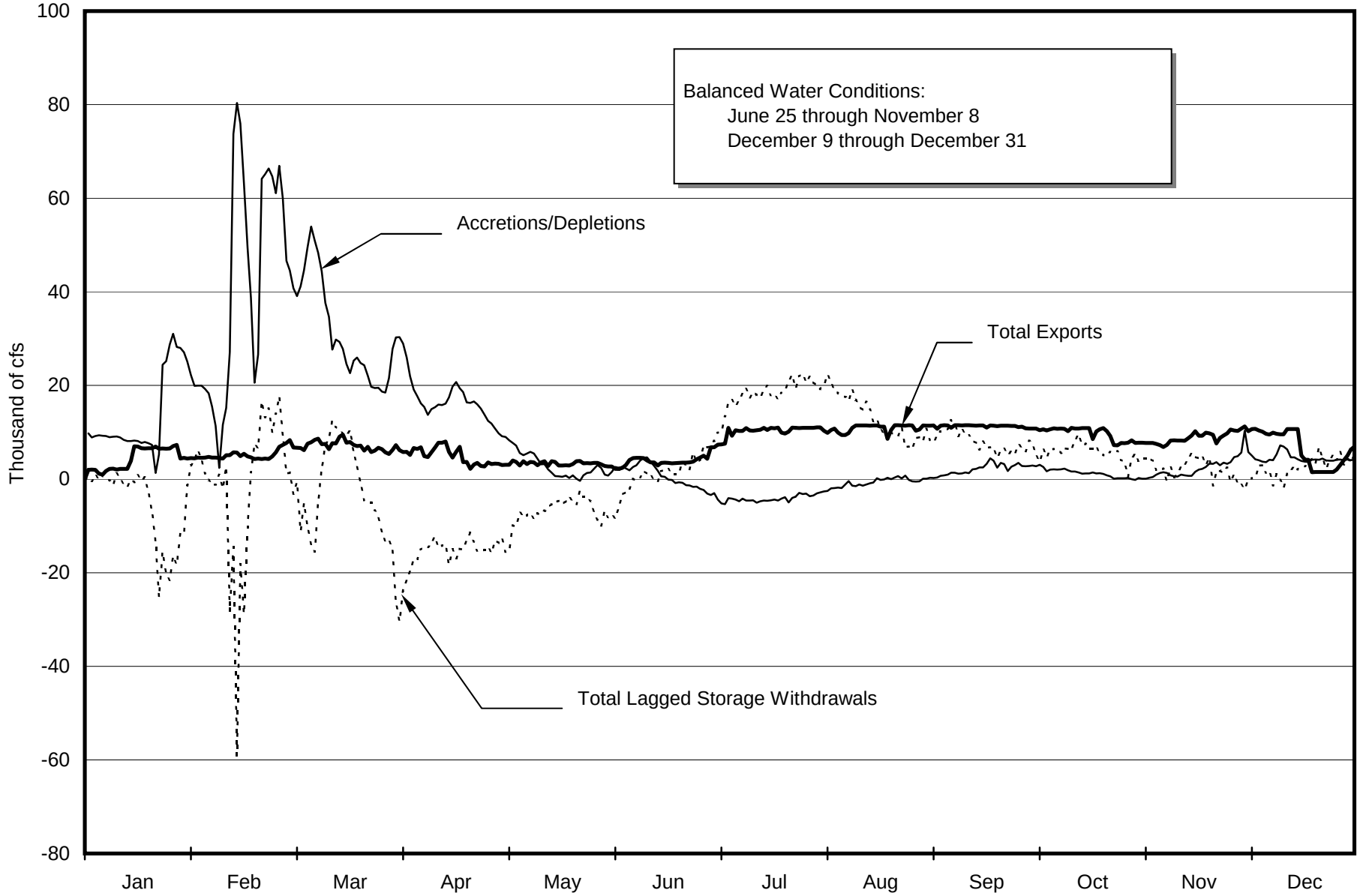
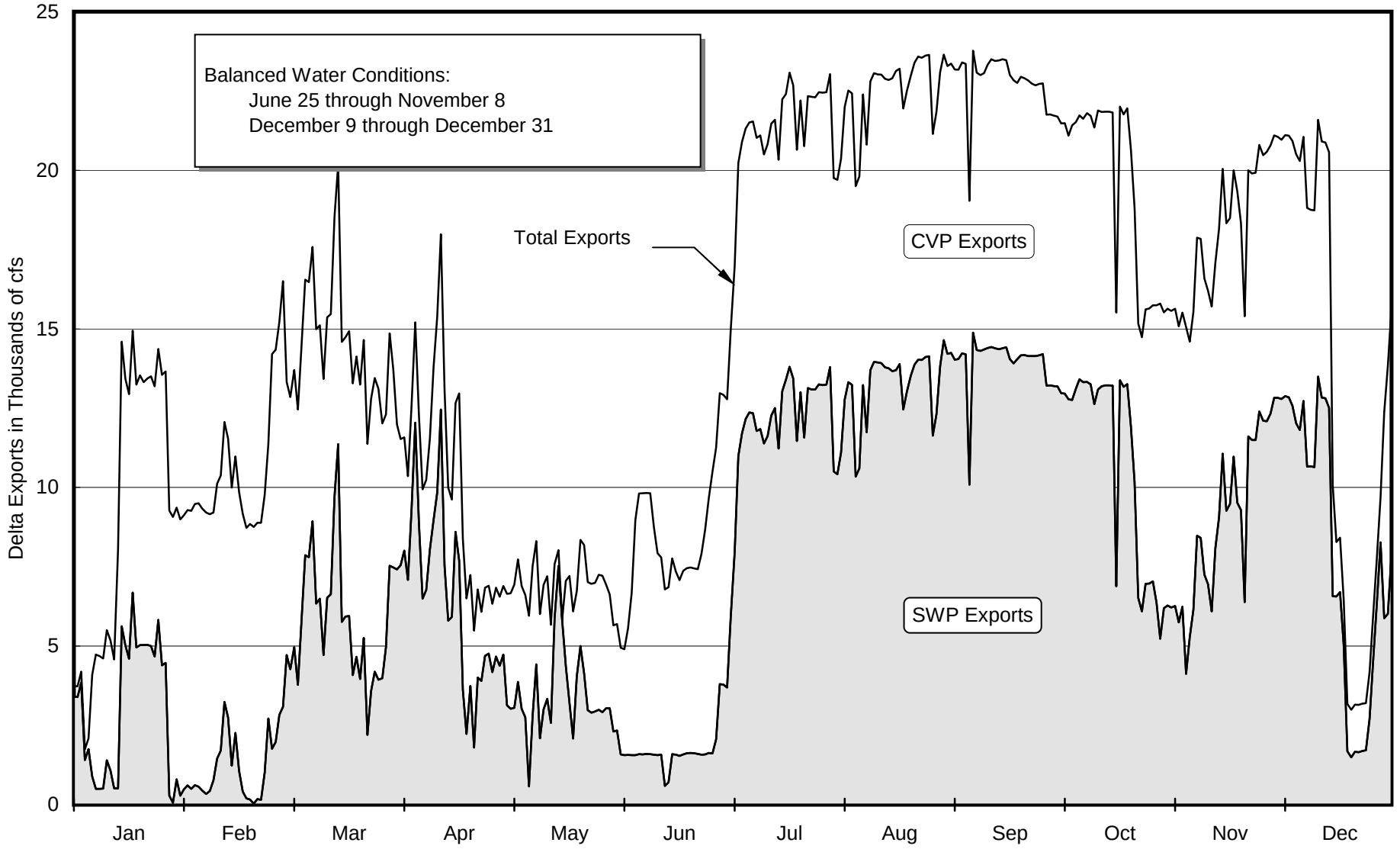


Figure 10. Coordinated Delta Operations
Delta Exports
1999



Project Operations by Field Division

Oroville Field Division

Water Storage

SWP water storage facilities in the Oroville Field Division include Lake Oroville, Thermalito Forebay and Afterbay (Oroville-Thermalito Complex) and upper Feather River reservoirs consisting of Lake Davis, Frenchman Lake, and Antelope Lake. Lake Oroville operations store winter and spring runoff for later SWP use for power generation, flood control, recreation, fish and wildlife enhancement, in addition to water supply.

The Upper Feather River Reservoirs have a combined capacity of 162,000 AF. Monthly operations for the three Upper Feather River reservoirs are presented in Table 7. The table below compares storage capacity with the largest end-of-month storage for each reservoir for the last five years:

	Reservoir (Capacity)		
	Antelope	Frenchman	Davis
Year	22,566	55,477	84,371
1999	(May) 23,447	(Apr) 57,651	(May) 80,205
1998	(Apr) 24,030	(Apr) 56,989	(Jun) 74,142
1997	(Jan) 27,696	(Jan) 58,350	(Jan) 83,929
1996	(Dec) 23,944	(Mar) 57,881	(May) 81,858
1995	(Apr) 25,242	(Apr) 58,172	(May) 84,331

The total amount of unimpaired runoff to Lake Oroville for the 1998-99 water year totaled about 4.49 MAF, (100 percent of average). Lake Oroville storage at the beginning of 1999 was 2,692,041 AF (76 percent of normal maximum operating capacity). Storage peaked on June 13,1999 at 3,481,007 AF, (98 percent of normal maximum operating capacity). Lowest storage in Lake Oroville in 1999 was 2,186,332 (62 percent of normal maximum operating capacity) on December 31.

Lake Oroville's computed inflow is tabulated in Table 8 and plotted along with releases, diversions, and storage withdrawals on Figure 11. A ten-year historical summary of Lake Oroville's storage and inflow is illustrated on Figure 12.

Water temperatures on and below the lake's surface are monitored very closely throughout the year at various locations around the lake. Two intakes to the powerplant have shutters that control the depth from which water enters the plant. The temperature of water entering the fish hatchery can then be controlled by adding or removing shutters as necessary. A complete illustration of water temperature and intake operation is shown on Figure 14. Further discussions on water temperature operations are detailed in *"Water Deliveries and Aqueduct Operations."*

Water Deliveries

Project water stored in the Upper Feather Area Lakes flows into Lake Oroville through the North and Middle Forks of the Feather River. Contract deliveries from Frenchman Lake totaled 12,241 AF to Last Chance Creek WA. Non-project deliveries (prior water rights) totaling 816 AF were made out of Lake Davis.

Water stored in Lake Oroville is released into the Thermalito Diversion Dam Pool, from which specified quantities are released into both the Feather River and the Thermalito Power Canal. The power canal supplies water first to the Thermalito Forebay and then to Thermalito Afterbay. From the Thermalito Afterbay, additional water is released to the Feather River and several local distribution systems used to deliver water to prior water right holders. These deliveries are collectively called the Feather River Service Area diversions. FRSA diversions are not considered SWP benefits, as they predate the SWP construction, and would have occurred in the absence of the SWP to the limit of available natural river flows. Nearly all FRSA diversions are for agricultural use and totaled 1,094,989 AF in 1999, about 234,099 AF more than in 1998. All FRSA prior water rights diversions are detailed below:

Sutter Butte Canal	552,390
Richvale Canal	158,500
Sunset Pumps	14,719
Western Canal Lateral	4,491
Western Canal	322,120
Tudor Mutual	4,572
Garden Highway	16,809
Plumas Mutual	11,205
Oswald Water District	1,722
Palermo Canal	7,645
Lake Davis	816
Total in AF	1,094,989

In addition to the contract deliveries in Lake Davis and the prior water rights deliveries, the SWP delivered 2,567 AF of Local water to Thermalito Irrigation District, 286 AF of Table A and 1 AF of recreation to County of Butte, and 1,096 AF of Table A water to Yuba City. Total deliveries in the Oroville Field Division were 1,111,180 AF in 1999.

Table 7. Upper Feather Area Lakes Monthly Operation

1999

(in acre-feet except as noted)

Month	Lake Storage			Outflow							Inflow
				Regulated Release							
	Water Surface Elevation (in feet)	End of Month Storage	Storage Change	Stream-Flow Maint.	Water Supply Contract	Prior Water Rights	Total Regulated Release	Spill	Estimated Evaporation and Seepage	Total Outflow	Computed
Antelope Lake			**Capacity 22,566 acre-feet**								
Jan	5000.64	21,323	1,593	1,230	0	0	1,230	0	61	1,291	2,884
Feb	5001.20	21,829	506	2,606	0	0	2,606	0	73	2,679	3,185
Mar	5000.18	20,912	-917	6,149	0	0	6,149	0	107	6,256	5,339
Apr	5002.71	23,229	2,317	5,950	0	0	5,950	428	178	6,556	8,873
May	5002.93	23,437	208	0	0	0	0	10,897	305	11,202	11,410
Jun	5002.10	22,657	-780	780	0	0	780	2,735	475	3,990	3,210
Jul	5000.81	21,476	-1,181	1,230	0	0	1,230	8	596	1,834	653
Aug	4999.04	19,903	-1,573	1,230	0	0	1,230	0	574	1,804	231
Sep	4997.43	18,537	-1,366	1,087	0	0	1,087	0	549	1,636	270
Oct	4995.90	17,292	-1,245	1,230	0	0	1,230	0	366	1,596	351
Nov	4994.73	16,375	-917	1,190	0	0	1,190	0	125	1,315	398
Dec	4993.56	15,488	-887	1,230	0	0	1,230	0	83	1,313	426
Total	---	---	-4,242	23,911	0	0	23,911	14,069	3,492	41,472	37,230
Frenchman Lake			**Capacity 55,477 acre-feet**								
Jan	5583.43	48,550	1,996	123	0	0	123	0	100	223	2,219
Feb	5585.42	51,495	2,945	111	0	0	111	0	104	215	3,160
Mar	5588.88	56,878	5,383	123	0	0	123	2,089	188	2,400	7,783
Apr	5589.30	57,555	677	119	0	0	119	9,794	322	10,235	10,912
May	5588.71	56,606	-949	123	0	0	123	10,017	531	10,671	9,722
Jun	5587.40	54,534	-2,072	60	1,690	0	1,750	2,138	824	4,712	2,640
Jul	5584.71	50,432	-4,102	0	3,602	0	3,602	0	913	4,515	413
Aug	5581.24	45,428	-5,004	0	4,108	0	4,108	0	1,009	5,117	113
Sep	5579.50	43,037	-2,391	0	1,835	0	1,835	0	684	2,519	128
Oct	5578.88	42,204	-833	0	835	0	835	0	536	1,371	538
Nov	5578.80	42,097	-107	63	171	0	234	0	213	447	340
Dec	5578.92	42,257	160	123	0	0	123	0	147	270	430
Total	---	---	-4,297	845	12,241	0	13,086	24,038	5,571	42,695	38,398
Lake Davis			**Capacity 84,371 acre-feet**								
Jan	5770.56	67,507	2,545	1,414	0	0	1,414	0	247	1,661	4,206
Feb	5771.59	71,241	3,734	1,277	0	0	1,277	0	253	1,530	5,264
Mar	5772.10	73,131	1,890	5,052	0	0	5,052	0	444	5,496	7,386
Apr	5773.38	77,988	4,857	5,415	0	0	5,415	0	758	6,173	11,030
May	5773.95	80,204	2,216	4,023	0	0	4,023	0	1,281	5,304	7,520
Jun	5773.46	78,298	-1,906	1,264	0	104	1,369	0	1,751	3,120	1,214
Jul	5772.47	74,518	-3,780	1,184	0	230	1,414	0	2,477	3,891	111
Aug	5770.81	68,404	-6,114	3,987	0	272	4,259	0	2,392	6,651	537
Sep	5768.19	59,335	-9,069	6,840	0	210	7,049	0	2,140	9,189	120
Oct	5767.63	57,491	-1,844	1,349	0	0	1,349	0	921	2,270	426
Nov	5767.23	56,195	-1,296	1,369	0	0	1,369	0	351	1,720	424
Dec	5766.81	54,853	-1,342	1,373	0	0	1,373	0	351	1,724	382
Total	---	---	-10,109	34,546	0	816	35,362	0	13,366	48,728	38,619

Table 8. Lake Oroville Monthly Operation
1999

(in acre-feet except as noted)

Capacity 3,537,577 acre-feet

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Outflow					Hyatt Pumpback	Computed Inflow 2/
				Hyatt Generation 1/	Palermo Canal	Evaporation	Spill	Total Outflow		
Jan	846.96	2,767,779	79,903	433,965	170	901	0	435,036	0	514,939
Feb	848.74	2,791,482	23,703	741,557	158	1,032	138,872	881,619	0	905,322
Mar	859.74	2,941,141	149,659	505,512	167	2,334	55,478	563,491	0	713,150
Apr	881.02	3,246,589	305,448	253,198	200	5,064	0	258,462	0	563,910
May	894.70	3,454,519	207,930	328,886	929	7,632	0	337,447	0	545,377
Jun	892.43	3,419,375	-35,144	296,024	1,080	9,594	0	306,698	0	271,554
Jul	854.21	2,865,217	-554,158	717,513	1,190	11,085	0	729,788	0	175,630
Aug	832.30	2,577,812	-287,405	456,337	1,170	9,184	0	466,691	0	179,286
Sep	820.14	2,427,271	-150,541	277,647	1,110	7,692	0	286,449	32,582	103,326
Oct	808.99	2,294,809	-132,462	262,961	967	6,701	0	270,629	835	137,332
Nov	808.39	2,287,827	-6,982	219,966	309	1,827	0	222,102	9,970	205,150
Dec	799.52	2,186,332	-101,495	282,468	195	1,641	0	284,304	10,002	172,807
Total	- - -	- - -	-501,544	4,776,034	7,645	64,687	194,350	5,042,716	53,389	4,487,783

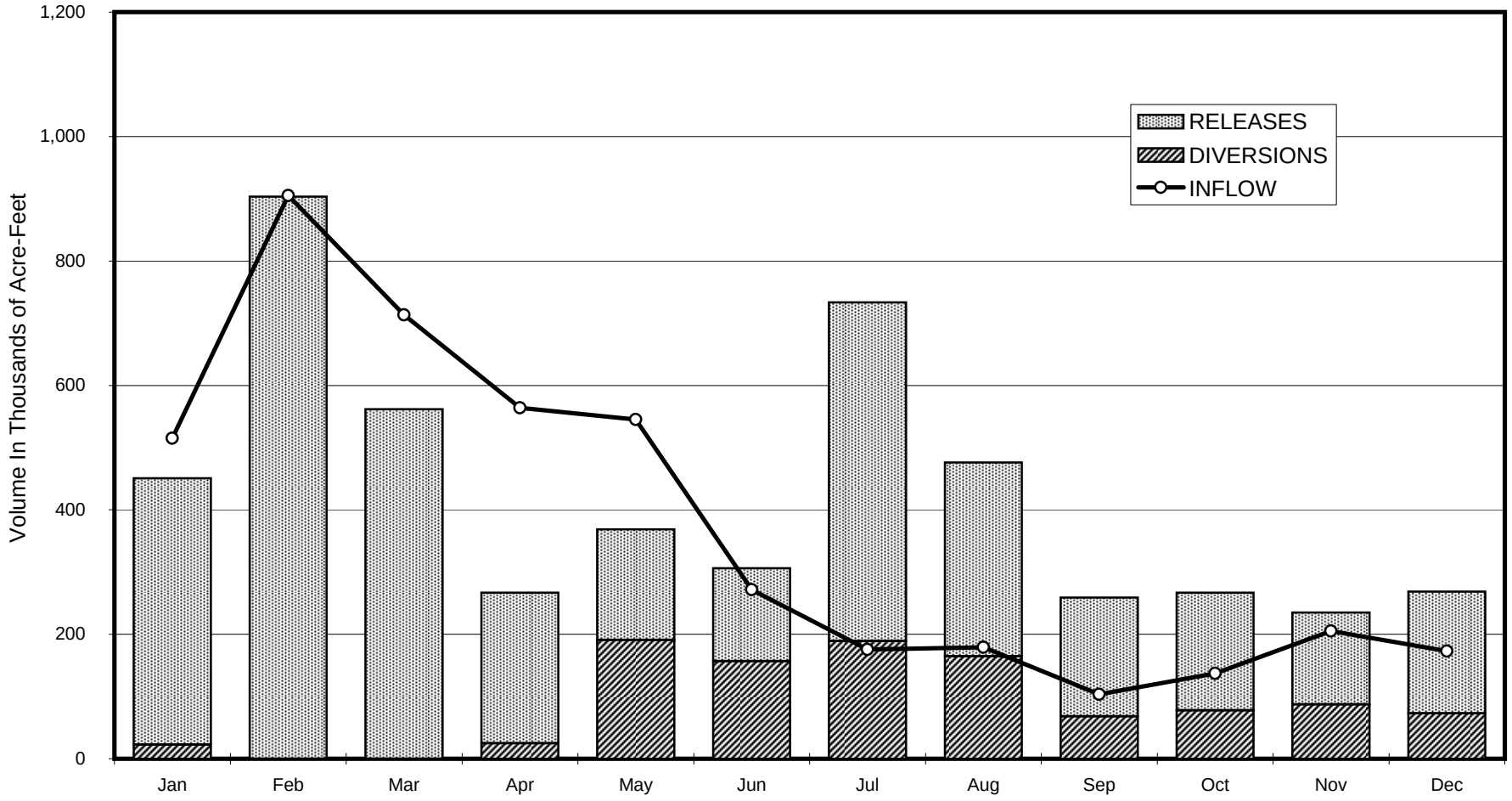
1/ Includes bypass flows.

2/ Does not include pumpback.

Figure 11. Oroville-Thermalito Complex

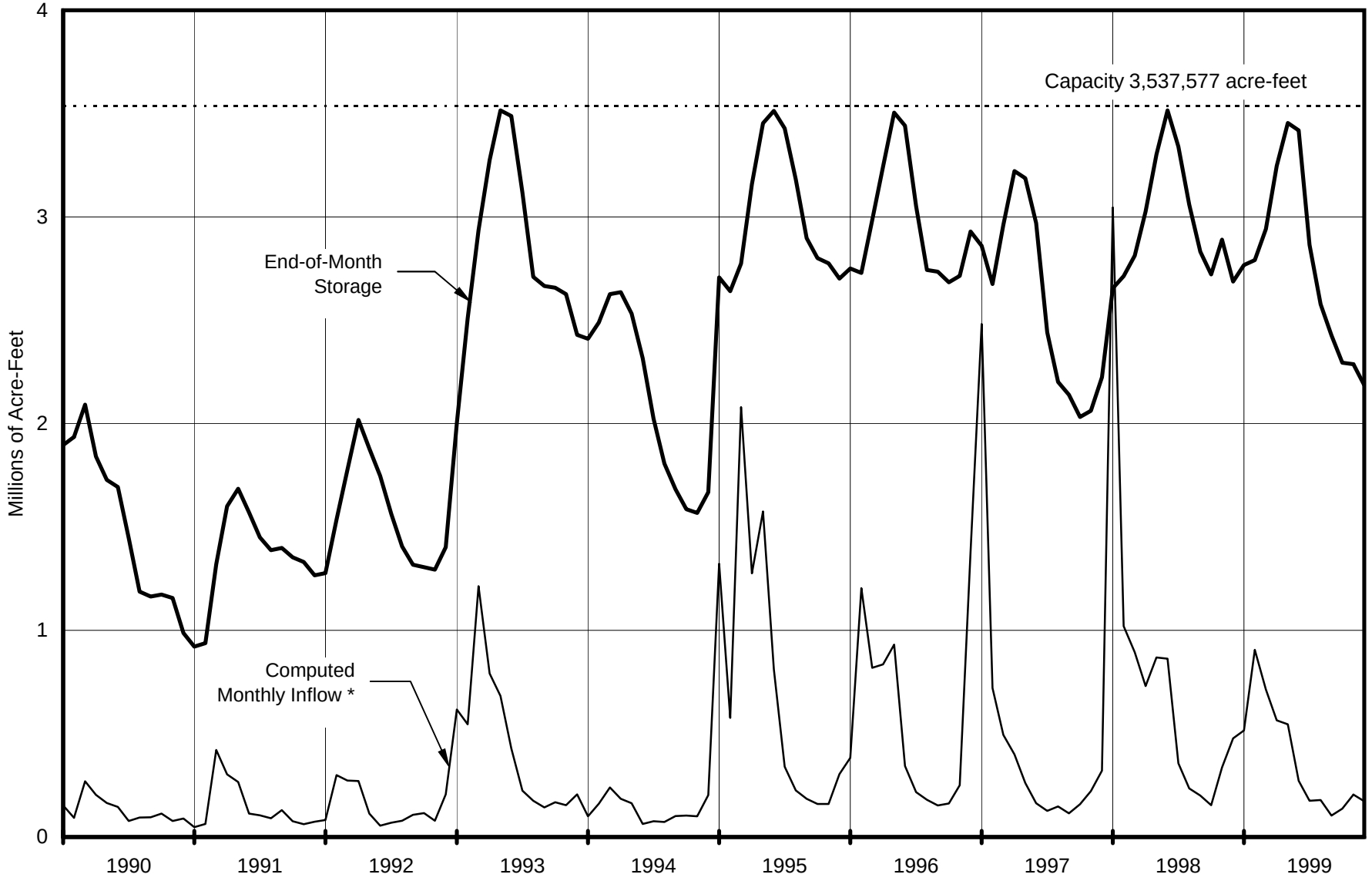
Inflow, Releases, and Diversions

1999



Note: Releases include flows at fish barrier dam, fish hatchery, and afterbay river outlet. Diversions include Butte County, Thermalito Irrigation District, Sutter Butte Canal, Western Lateral, Richvale Canal, Sunset Pumps, and Western Canal. The area between the plotted lines above the Inflow line represents amounts derived from storage.

Figure 12. Historical Lake Oroville Operation



* Excludes pumpback.

Figure 13. Operation of Lake Oroville for Flood Control

1998-99

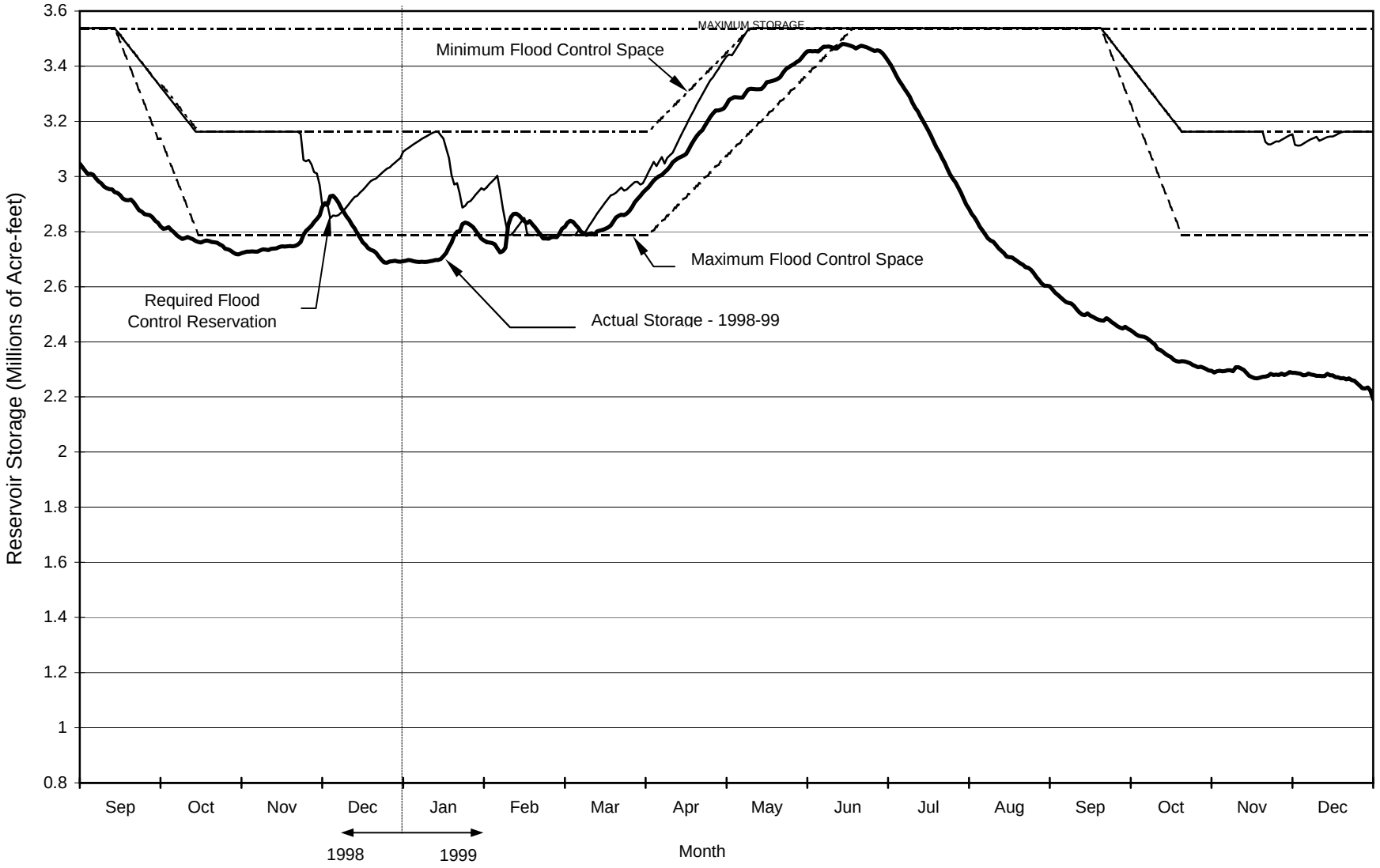
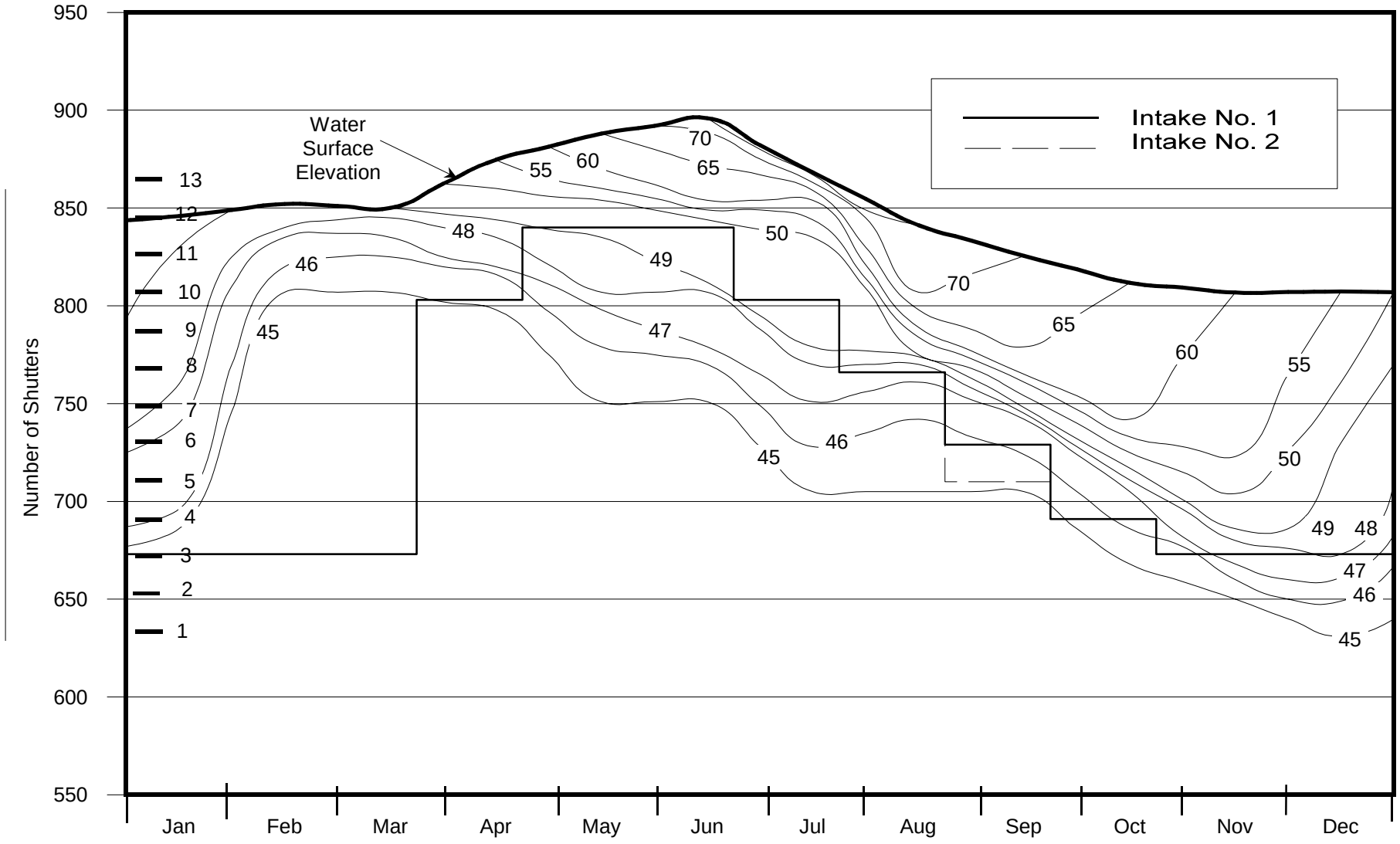


Figure 14. Lake Oroville Temperatures
1999
(isotherms in degrees Farenheit)



Note: Temperature data is taken once per month and averaged for the rest of the year.

Table 9. Thermalito Forebay Monthly Operation
1999

Including Diversion Pool and Power Canal
(end of month storage in acre-feet)

Month	Storage 2/	Storage Change	Inflow			Outflow					Losses (-) And Gains (+)
			Lake Oroville Releases 2/	Kelly Ridge Generation	Thermalito Pumpback	Thermalito Generation 3/	Butte County	Thermalito Irrigation District	Releases To River 4/	Hyatt Powerplant Pumpback	
Jan	22,375	-496	433,965	15,620	0	420,126	77	106	38,260	0	8,488
Feb	22,934	559	880,429	13,730	0	791,490	77	106	107,581	0	5,654
Mar	22,924	-10	560,990	15,600	0	521,817	80	110	57,145	0	2,552
Apr	24,144	1,220	253,198	14,680	0	234,973	2	130	36,918	0	5,365
May	24,756	612	328,886	15,630	0	310,667	1	282	38,231	0	5,277
Jun	23,344	-1,412	296,024	14,730	0	279,382	2	335	36,720	0	4,273
Jul	23,261	-83	717,513	15,110	0	703,435	6	401	38,480	0	9,616
Aug	23,202	-59	456,337	15,210	0	437,839	20	350	37,976	0	4,579
Sep	23,238	36	277,647	9,410	31,979	251,126	4	297	39,228	32,582	4,237
Oct	24,310	1,072	262,961	12,720	1,420	240,819	2	237	39,357	835	5,221
Nov	23,254	-1,056	219,966	11,470	10,970	199,925	13	109	37,918	9,970	4,473
Dec	21,824	-1,430	282,468	6,460	11,077	256,736	3	104	38,739	10,002	4,149
Total	- - -	-1,047	4,970,384	160,370	55,446	4,648,335	287	2,567	546,553	53,389	63,884

1/ Sum of Thermalito Forebay and Diversion Pool.
2/ Sum of releases from Lake Oroville through Hyatt plant, spill, and spillway leakage.
3/ Includes bypass flows.
4/ Sum of Diversion Dam generation plus Hatchery.

Table 10. Thermalito Afterbay Monthly Operation
1999

(end of month storage in acre-feet)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Outflow						Losses (-) And Gains (+)
				Thermalito Generation 1/	Sutter Butte Canal	Western Canal Lateral	Richvale Canal	Western Canal	River Outlet	Thermalito Pumpback	
Jan	128.93	28,688	-443	420,126	12,330	26	6,620	3,760	389,792	0	-8,041
Feb	127.90	25,532	-3,156	791,490	0	0	0	0	795,502	0	856
Mar	132.91	42,501	16,969	521,817	0	0	0	0	504,428	0	-420
Apr	132.93	42,576	75	234,973	16,020	109	3,660	4,900	205,094	0	-5,115
May	128.20	26,433	-16,143	310,667	101,900	831	23,560	58,230	139,456	0	-2,833
Jun	128.73	28,062	1,629	279,382	88,360	783	20,860	45,060	112,935	0	-9,755
Jul	129.49	30,478	2,416	703,435	96,100	1,030	27,270	61,210	506,187	0	-9,222
Aug	129.29	29,833	-645	437,839	88,090	928	24,430	47,100	273,485	0	-4,451
Sep	128.39	27,012	-2,821	251,126	49,240	107	5,870	11,830	152,079	31,979	-2,842
Oct	131.98	39,047	12,035	240,819	34,700	0	9,540	33,090	150,000	1,420	-34
Nov	131.19	36,221	-2,826	199,925	35,350	324	19,500	32,150	109,600	10,970	5,143
Dec	134.65	49,315	13,094	256,736	30,300	353	17,190	24,790	157,093	11,077	-2,839
Totals			20,184	4,648,335	552,390	4,491	158,500	322,120	3,495,651	55,446	-39,553

1/ Includes bypass flows.

Delta Field Division

Water Storage

The Delta Field Division consists of the North Bay Aqueduct, the South Bay Aqueduct, and the California Aqueduct from Clifton Court Forebay to Check 12. Along these waterways, water storage operations take place at Clifton Court Forebay, Bethany Reservoir, Travis Tank, Napa Terminal Tank, the California Aqueduct, and Lake Del Valle. Water storage data at the South Bay Aqueduct are not reported; storage changes are assumed to be zero for operational purposes.

Pumping from Lake Del Valle back into the Aqueduct usually occurs in the fall and is detailed in Table 11. Inflow and storage changes for the last ten years at Lake Del Valle are shown on Figure 15.

Project water flows from the Delta into Clifton Court Forebay through the Clifton Court control gates. A schedule of daily gate operation is published in the *SWP Monthly Report of Operations*. Monthly inflows to Clifton Court Forebay along with corresponding storage changes are shown in Table 11.

Water Deliveries

The Delta Field Division delivered 171,187 AF of water in 1999. These and other deliveries are summarized in Table 2.

The North Bay Aqueduct system, completed in May 1988, begins in the North Delta at the Barker Slough Facilities. Sacramento River water is conveyed through Cache, Lindsey, and Barker sloughs to the Barker Slough pumping plant. From the pumping plant, water is conveyed by pipe for 24 miles northwest to contractors in Napa and Solano Counties and to the Cordelia Pumping Plant. Deliveries are made to Solano County water users via turnouts along the pipe's length. From the Cordelia Pumping Plant, the North Bay Aqueduct terminates at the Napa Terminal Tank. The Aqueduct supplied 40,057 AF to Napa and Solano counties.

A division-wide total of 145,425 AF went to SWP Table A contractors, 23,016 AF of Local Water was conveyed to Alameda County Flood Control and Water Conservation District, Zone 7, and to the Alameda County Water District, 607 AF of Federal Wheeling to Musco Olive, Tracy Golf Course, and the V. A. Cemetery, 2,000 AF of General Wheeling to Alameda County Flood Control and Water Conservation District, Zone 7, and 139 AF of Recreation water.

Pumping Plants

Delta Field Division pumping plants include Barker Slough Pumping Plant and Cordelia Pumping Plant on the North Bay Aqueduct, Banks on the California Aqueduct, and South Bay and Del Valle Pumping Plants on the South Bay Aqueduct. Monthly pumping data is summarized for the year in Table 1.

Banks Pumping Plant was originally built to accommodate 11 units. Initially, seven pumps were constructed for a total pumping capacity of 6,400 cfs. Construction of the final four pumps was completed in 1990, each with a design capacity of 1,067 cfs and a new total capacity of 10,500 cfs. Export pumping rates are increased on weekends to take advantage of less costly off-peak electricity. This produces sharp peaks in the export rate at about 7-day intervals.

In 1999, The SWP diverted 2,706,835 AF of water at Banks Pumping Plant, including 35,704 AF of CVP water wheeled by the Department. Below is a five-year summary of federal, State, and total pumping at Banks:

Banks Pumping Plant
(in AF)

Year	Federal	State	Total
1999	35,704	2,671,131	2,706,835
1998	28,087	1,659,323	1,687,410
1997	201,033	2,343,653	2,544,686
1996	210,121	3,031,102	3,241,223
1995	28,417	2,088,462	2,116,879

Table 11. Lake Del Valle Monthly Operation

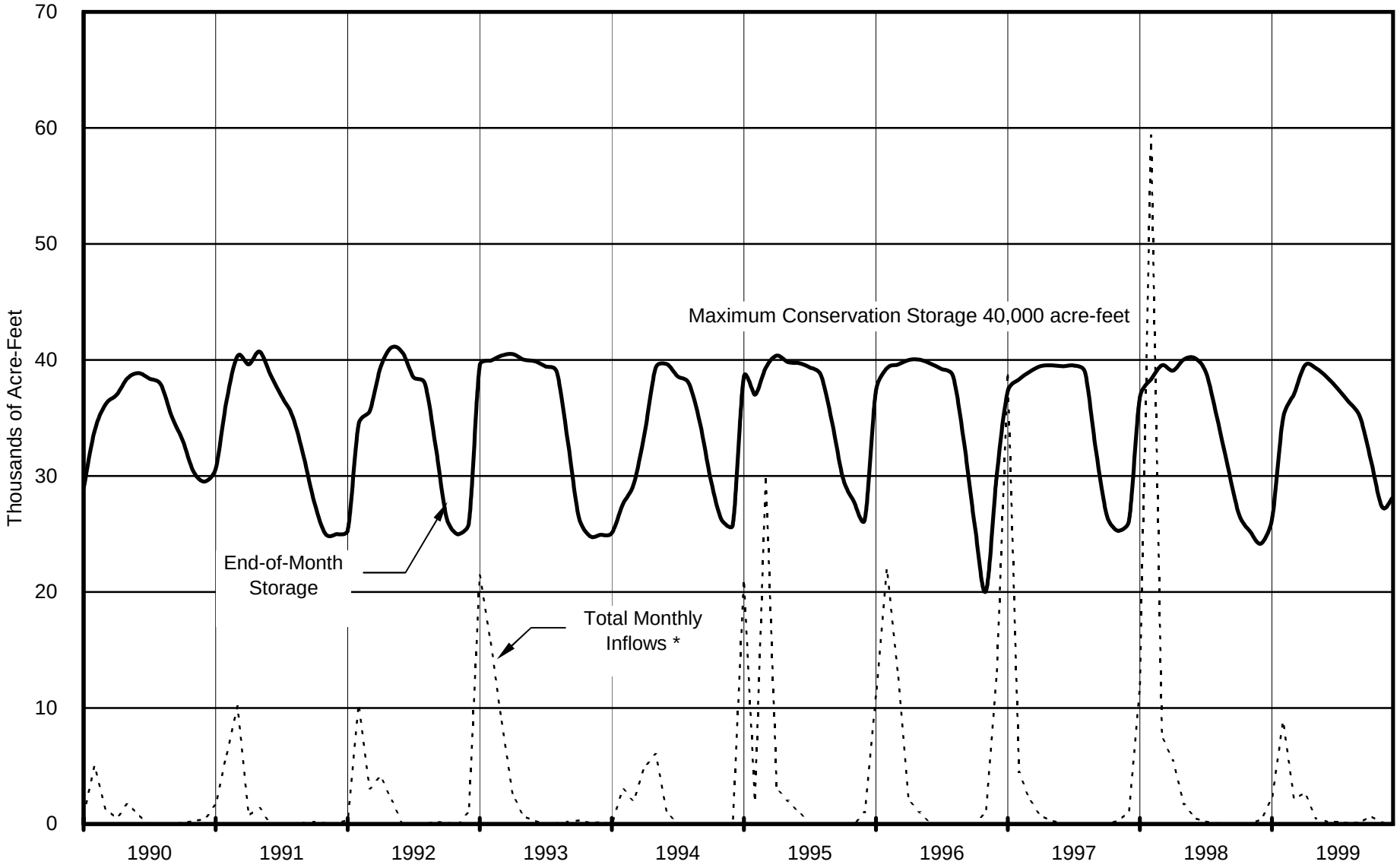
1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow		Outflow					Precipitation (inches)
				Natural	South Bay Aqueduct	South Bay Aqueduct	Recreation 1/	Arroyo Valle	Evaporation	Total	
Jan	680.86	26,228	2,050	1,841	328	77	2	0	40	119	3.40
Feb	695.77	35,000	8,772	7,348	1,479	0	1	0	54	55	3.62
Mar	698.88	37,066	2,066	2,175	0	0	4	0	105	109	1.98
Apr	702.47	39,541	2,475	2,674	0	0	5	0	194	199	1.19
May	702.12	39,295	-246	500	0	462	12	0	272	746	0.07
Jun	700.96	38,488	-807	118	64	618	21	0	350	989	0.30
Jul	699.50	37,486	-1,002	69	107	716	24	0	438	1,178	0.00
Aug	697.80	36,340	-1,146	45	47	846	20	0	372	1,238	0.00
Sep	695.89	35,078	-1,262	80	42	1,026	22	0	336	1,384	0.00
Oct	689.76	31,237	-3,841	242	419	4,180	15	0	307	4,502	0.23
Nov	682.94	27,334	-3,903	156	0	3,937	8	0	114	4,059	1.43
Dec	684.46	28,167	833	127	1,576	770	5	0	95	870	0.32
Total	---	---	3,989	15,375	4,062	12,632	139	0	2,677	15,448	12.54

1/ To East Bay Regional Park District.

Figure 15. Historical Lake Del Valle Operation



* Natural and pumped inflows.

Table 12. Clifton Court Forebay Monthly Operation

1999

(elevation in feet, storage in acre-feet)

Month	Water Surface Elevation	Storage	Storage Change	Inflow
Jan	1.88	22,319	2,353	87,729
Feb	1.91	22,384	65	52,118
Mar	1.19	20,829	-1,555	181,295
Apr	0.30	18,909	-1,920	184,842
May	-1.54	14,952	-3,957	100,889
Jun	-0.85	16,434	1,482	66,930
Jul	0.41	19,146	2,712	385,344
Aug	-1.34	15,382	-3,764	411,092
Sep	-0.15	17,940	2,558	413,933
Oct	0.68	19,728	1,788	306,551
Nov	-0.39	17,424	-2,304	308,518
Dec	-1.10	15,854	-1,570	229,313
Total	- - -	- - -	-4,112	2,728,554

San Luis Field Division

Water Storage

San Luis Reservoir reached its maximum end-of-month storage for 1999, 2,027,835 AF (100 percent of maximum operating storage), at the end of March. Maximum operating storage capacity in San Luis is 2,027,835 AF. Minimum end-of-month storage for the year of 520,283 AF (26 percent of maximum operating storage) occurred in August. The State's share of San Luis Reservoir end-of-month storage reached the maximum of 1,104,033 AF in January (100 percent of State's maximum operating storage), and the minimum of 451,340 AF (42 percent of State's maximum operating storage) was reached in August. Table 13 and Figure 16 show San Luis Reservoir operations during 1999. Table 14 shows the monthly operation of O'Neill Forebay during 1999.

There are two accounting procedures for calculating storage shares in O'Neill Forebay. One calculates storage shares using actual SWP/USBR deliveries made from water out of O'Neill. The other method calculates storage shares in O'Neill using amounts pumped for each agency derived from scheduled energy. Since scheduled pumping and water deliveries never match, there is always a difference that is carried over into subsequent months. These mismatches are used to "underschedule" or "overschedule" energy and pumping in order to bring the mismatch back into alignment or closer to zero.

Pumping and Generating Plants

Total pumping in 1999 at Gianelli Pumping-Generating Plant was 1,241,561 AF. Water released from San Luis Reservoir to O'Neill Forebay for generation was 1,740,193 AF. Total pumping at Dos Amigos Pumping Plant in 1999 was 4,073,298 AF, about 1,577,086 AF more than was pumped in 1998. The water pumped at Dos Amigos Pumping Plant includes 19,672 AF of federal water wheeled by SWP to Cross Valley Canal CVP contractors. Table 15 summarizes joint-use plant activity on a monthly basis.

Water Deliveries

SWP water deliveries in the San Luis Field Division during 1999 included 13,969 AF of State water to Westlands Water District and 1,645 AF of State and federal deliveries to the DFG and the Department of Parks and Recreation (DPR) from the O'Neill Forebay and San Luis Reservoir (Reach 3). The following tabulation details the components of these recreation deliveries:

O'Neill Forebay and San Luis Reservoir (Reach 3)			
	DPR	DFG	Total
State	93	806	899
Federal	76	660	736
Sub-total	169	1,466	1,635
Pools 16, 17, & 18 (Reach 5)			
	DPR	DFG	Total
State	0	6	6
Federal	0	4	4
Sub-total	0	10	10

Federal deliveries from the joint-use facilities in the San Luis Field Division during 1999 totaled 1,256,031 AF.

Table 13. San Luis Reservoir Monthly Operation

1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Outlfow			Gain (+) And Loss (-)
				Gianelli P-G Plant Pumping	Gianelli P-G Plant Generation	Pacheco Tunnel	Parks and Rec. Del	
Jan	535.18	1,929,319	31,133	92,111	38,125	9,995	0	-12,858
Feb	539.67	1,985,676	56,357	74,206	1,620	8,348	0	-7,881
Mar	543.00	2,027,835	42,159	91,410	31,045	10,945	0	-7,261
Apr	533.94	1,913,855	-113,980	8,906	109,667	11,208	0	-2,011
May	499.05	1,496,796	-417,059	0	398,450	16,839	0	-1,770
Jun	446.36	936,402	-560,394	0	548,357	17,863	0	5,826
Jul	410.83	611,617	-324,785	12,800	324,361	16,032	0	2,808
Aug	399.67	520,283	-91,334	90,866	158,772	17,156	0	-6,272
Sep	421.32	702,409	182,126	213,358	1,859	11,798	0	-17,575
Oct	432.20	801,279	98,870	171,944	61,100	9,609	0	-2,365
Nov	460.08	1,073,901	272,622	297,150	8,729	3,563	0	-12,236
Dec	470.95	1,187,142	113,241	188,810	58,108	6,452	12	-10,997
Total	---	---	-711,044	1,241,561	1,740,193	139,808	12	-72,592

Figure 16. Historical San Luis Reservoir Operation

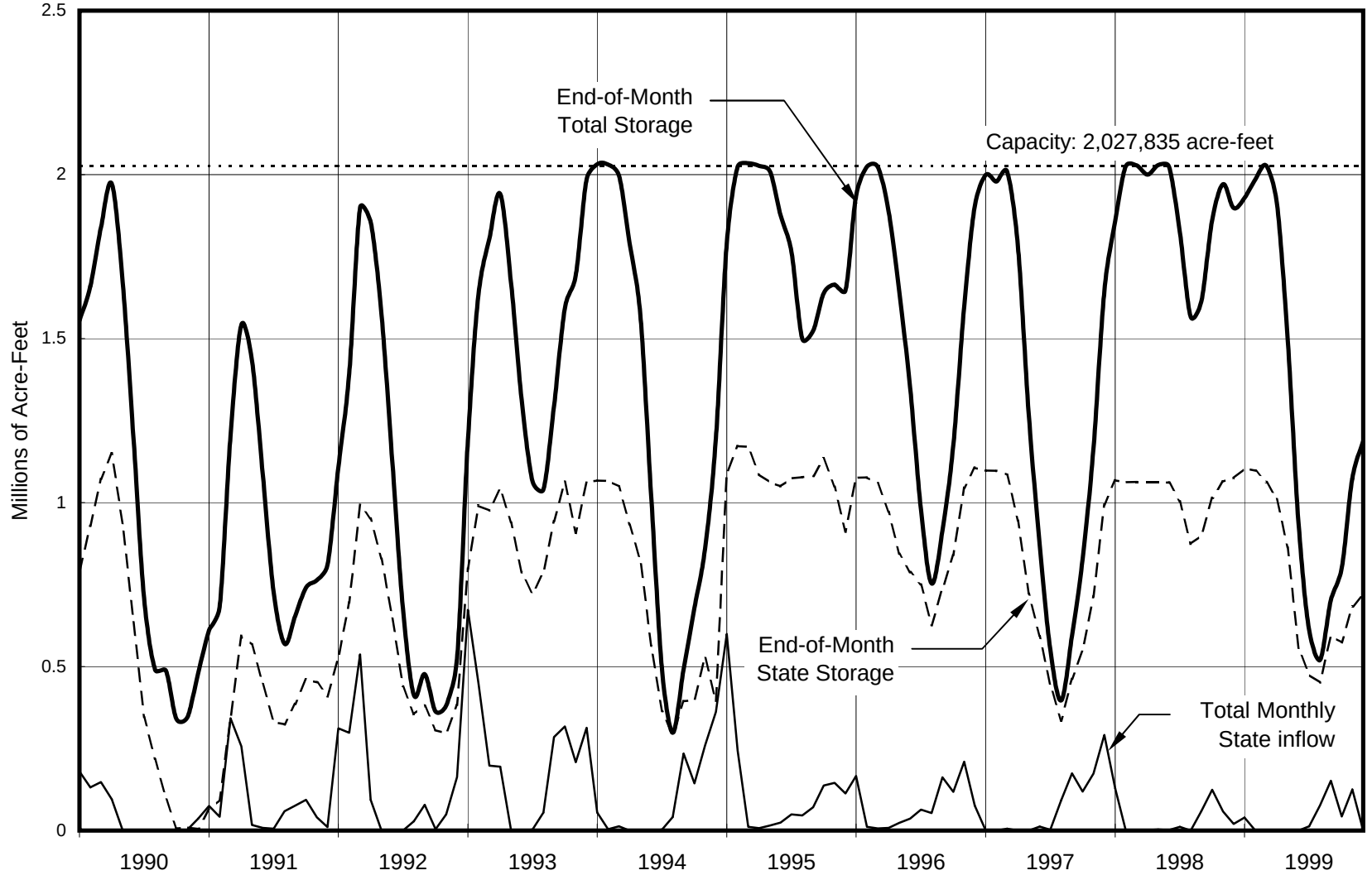


Table 14. O'Neill Forebay Monthly Operation

1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow				Outflow				Gain (+) And Losses (-)
				Pump In 1/	O'Neill P-G Plant Pumping	Gianelli P-G Plant Generation	California Aqueduct Check 12	O'Neill P-G Plant Generation	Gianelli P-G Plant Pumping	Dos Amigos Pumping	Deliveries	
Jan	220.87	45,420	602	0	135,047	38,125	76,906	6,602	92,111	157,987	336	7,560
Feb	221.36	46,705	1,285	0	168,458	1,620	45,472	0	74,206	141,376	1,179	2,496
Mar	220.94	45,603	-1,102	0	177,377	31,045	177,243	0	91,410	296,883	814	2,340
Apr	221.39	46,784	1,181	0	41,669	109,667	180,860	23,524	8,906	290,604	1,111	-6,870
May	222.05	48,517	1,733	0	701	398,450	89,609	81,563	0	394,985	1,674	-8,805
Jun	220.75	45,106	-3,411	0	17,170	548,357	43,923	25,199	0	579,449	2,979	-5,234
Jul	222.35	49,314	4,208	0	29,189	324,361	349,943	969	12,800	685,328	3,951	3,763
Aug	222.86	50,673	1,359	0	70,917	158,772	377,784	0	90,866	523,988	2,785	11,525
Sep	220.23	43,749	-6,924	0	90,434	1,859	376,589	0	213,358	279,176	1,156	17,884
Oct	219.67	42,299	-1,450	0	136,748	61,100	276,802	0	171,944	309,673	915	6,432
Nov	220.49	44,427	2,128	0	189,813	8,729	288,454	0	297,150	198,799	163	11,244
Dec	222.88	50,726	6,299	0	132,049	58,108	212,993	5,306	188,810	215,050	413	12,728
Total	---	---	5,908	0	1,189,572	1,740,193	2,496,578	143,163	1,241,561	4,073,298	17,476	55,063

1/ Pump-in located at Mile 79.67R.

Table 15. State-Federal San Luis Joint-Use Facilities Operation

1999

(In acre-feet except as noted)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Check 12													
State	76,906	29,191	177,243	180,860	89,609	43,923	349,943	377,784	376,589	267,754	278,079	212,993	2,460,874
Federal	0	16,281	0	0	0	0	0	0	0	9,048	10,375		35,704
Total	76,906	45,472	177,243	180,860	89,609	43,923	349,943	377,784	376,589	276,802	288,454	212,993	2,496,578
O'Neill P-G Plant													
Amount Pumped													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	135,047	168,458	177,377	41,669	701	17,170	29,189	70,917	90,434	136,748	189,813	132,049	1,189,572
Total	135,047	168,458	177,377	41,669	701	17,170	29,189	70,917	90,434	136,748	189,813	132,049	1,189,572
Generation													
Federal	6,602	0	0	23,524	81,563	25,199	969	0	0	0	0	5,306	143,163
O'Neill Forebay													
End-of-Month Storage													
State *	24,935	23,798	22,343	25,140	26,287	22,450	23,698	26,184	22,051	23,071	18,250	24,274	- - -
Federal *	20,485	22,907	23,260	21,644	22,230	22,656	25,616	24,489	21,698	19,228	26,177	26,452	- - -
Total	45,420	46,705	45,603	46,784	48,517	45,106	49,314	50,673	43,749	42,299	44,427	50,726	- - -
San Luis Reservoir													
End-of-Month Storage													
State	1,104,033	1,097,239	1,061,810	1,011,660	863,263	555,482	476,177	451,340	591,805	573,857	683,525	717,432	- - -
Federal	825,286	888,437	966,025	902,195	633,533	380,920	135,440	68,943	110,604	227,422	390,376	469,710	- - -
Total	1,929,319	1,985,676	2,027,835	1,913,855	1,496,796	936,402	611,617	520,283	702,409	801,279	1,073,901	1,187,142	- - -
Gianelli P-G Plant													
Amount Pumped													
State	39,280	-839	-390	2,775	0	0	12,800	76,604	151,990	42,839	125,127	85,339	535,525
Federal	52,831	75,045	91,800	6,131	0	0	0	14,262	61,368	129,105	172,023	103,471	706,036
Total	92,111	74,206	91,410	8,906	0	0	12,800	90,866	213,358	171,944	297,150	188,810	1,241,561
Generation													
State	2,345	1,620	31,045	51,819	147,424	310,985	93,649	97,991	1,859	61,100	8,729	45,377	853,943
Federal	35,780	0	0	57,848	251,026	237,372	230,712	60,781	0	0	0	12,731	886,250
Total	38,125	1,620	31,045	109,667	398,450	548,357	324,361	158,772	1,859	61,100	8,729	58,108	1,740,193
Pacheco Tunnel													
Federal	9,995	8,348	10,945	11,208	16,839	17,863	16,032	17,156	11,798	9,609	3,563	6,452	139,808
Dos Amigos P.P.													
State	42,568	34,242	213,619	222,939	231,261	355,430	431,547	402,735	240,473	286,523	172,671	173,836	2,807,844
Federal	115,419	107,134	83,264	67,665	163,724	224,019	253,781	121,253	38,703	13,870	15,736	41,214	1,245,782
1/ Other	0	0	0	0	0	0	0	0	0	9,280	10,392	0	19,672
Total	115,419	107,134	83,264	67,665	163,724	224,019	253,781	121,253	38,703	23,150	26,128	41,214	4,073,298

* Negative storage values indicate a deficit in storage withdrawals versus amounts stored and positive values larger than the reservoir capacity indicate a surplus of amounts stored versus storage withdrawals.

1/ Wheeling of federal water to Cross Valley Canal CVP contractors.

San Joaquin Field Division

Water Deliveries

A total of 1,695,045 AF of deliveries were made in the San Joaquin Field Division in 1999. Water types include Table A, purchase, federal wheeling, and general wheeling. Kern County Water Agency (KCWA) represented 65 percent of the total SWP water delivered within the Division.

In addition to SWP deliveries, 10,476 AF of federal water was wheeled through SWP facilities to be delivered to the Kern National Wildlife Refuge.

The San Joaquin Field Division is the only field division in the SWP where there are no water storage facilities. All deliveries made from the Aqueduct are summarized in Table 22, and are totaled by agency on Table 2 and by water type on Map 3.

Pumping Plants

Pumping plants in the San Joaquin Field Division include Las Perillas and Badger Hill on the Coastal Aqueduct, and Buena Vista, Teerink, Chrisman, and Edmonston on the California Aqueduct. A complete monthly summary of amounts pumped at all of these plants is shown on Table 1. A summary of energy used to pump at each plant is shown on Table 4.

During 1999, 2,759,024 AF of State water and 23,280 AF of federal water flowed past Check 21 into the San Joaquin Field Division. The total water pumped at Edmonston Pumping Plant in 1999 was 1,000,618 AF.

Southern Field Division

Water Storage

There are four storage reservoirs in the Southern Field Division (Pyramid, Castaic, Silverwood, and Perris) with a combined storage capacity of 701,320 AF. Combined storage at the beginning of the year was 627,710 AF. End-of-year combined storage was 624,494 AF. Complete monthly operation tables for all four reservoirs plus Elderberry Forebay and Castaic Lagoon, along with historical inflow and storage data for the last ten years, is summarized in Tables 16 through 21 and Figures 17 through 20.

Water Deliveries

SWP deliveries in the Southern Field Division totaled 950,712 AF. Thirteen agencies received the water, which included 891,872 AF of Table A, 1,439 AF of transfer, 6,729 AF of exchange, 13 AF of local, 3,279 of recreation, and 47,380 AF of Purchase Pool B water.

Pumping and Generating Plants

Pumping plants in the Southern Field Division include Oso and Castaic on the West Branch, Pearblossom on the East Branch, and Cherry Valley, Green Spot, and Crafton Hills on the East Branch extension. A complete monthly summary of amounts pumped is shown on Table 1. A summary of energy used to pump and station service energy at each plant is shown on Table 4.

Generating plants in the Southern Field Division include Warne and Castaic on the West Branch, and Alamo, Mojave Siphon, and Devil Canyon on the East Branch. Energy available from each generating plant is summarized in Table 3. Combined generation at all five plants in 1999 totaled 1,320,235 MWh.

Table 16. Pyramid Lake Monthly Operation
1999

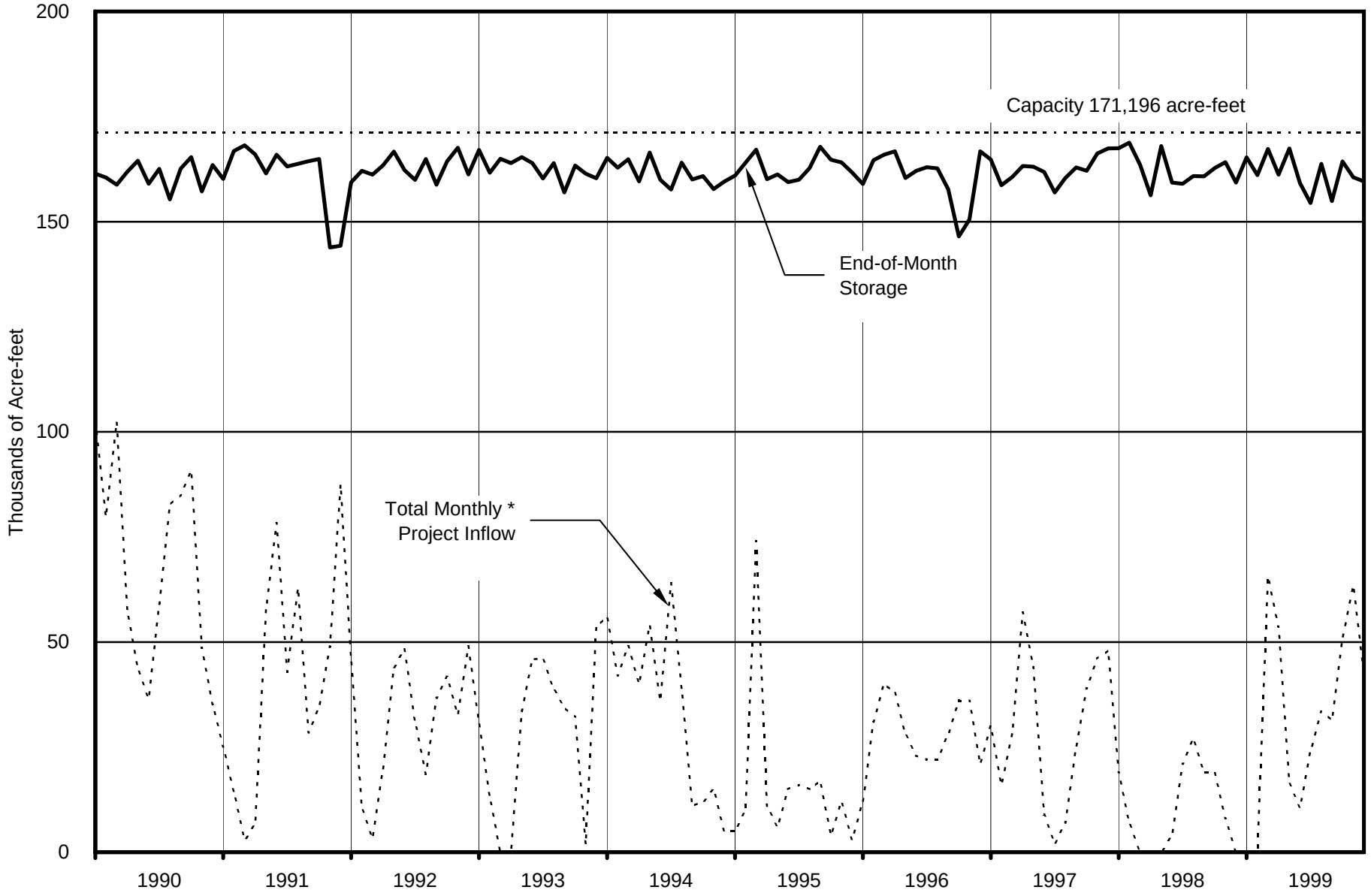
(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Natural Inflow Storage Shares	Storage Change	Inflow			Outflow			Computed Losses (-) Ans Gains (+)
					Project		Natural Stream Flow	Project		Natural To Piru Creek 2/	
					Castaic Powerplant Pumpback 1/	Warne Powerplant		Castaic Powerplant Generation	Recreation Deliveries		
Jan	2574.40	165,295	-358	6,012	71,452	0	1,872	68,406	0	1,624	2,718
Feb	2571.04	161,071	-126	-4,224	48,249	0	2,008	54,431	0	1,776	1,726
Mar	2575.96	167,281	332	6,210	32,667	65,474	2,228	95,361	0	1,770	2,972
Apr	2571.11	161,158	992	-6,123	67,979	53,549	3,613	129,198	0	2,953	887
May	2576.05	167,396	1,176	6,238	119,220	16,375	1,686	128,914	0	1,502	-627
Jun	2569.52	159,184	612	-8,212	127,199	10,568	958	139,688	3	1,522	-5,724
Jul	2565.63	154,418	-10	-4,766	122,402	24,061	934	145,066	4	1,556	-5,537
Aug	2573.19	163,766	-1,052	9,348	133,383	33,422	535	149,551	5	1,577	-6,859
Sep	2566.01	154,879	-2,068	-8,887	118,422	31,383	514	152,545	5	1,530	-5,126
Oct	2573.62	164,308	-2,506	9,429	81,547	50,944	586	118,605	1	1,024	-4,018
Nov	2570.64	160,573	-2,349	-3,735	56,610	63,362	728	120,925	0	571	-2,939
Dec	2569.85	159,592	-2,137	-981	60,223	42,595	831	101,046	0	619	-2,965
Total	- - -	- - -	- - -	309	1,039,353	391,733	16,493	1,403,736	18	18,024	-25,492

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) from Elderberry Forebay through Castaic powerplant.

2/ Stream flow releases, portions of which are used to satisfy fishery enhancement agreement.

Figure 17. Historical Pyramid Lake Operation



* Excludes pumpback by LADWP through Castaic Powerplant.

Table 17. Elderberry Forebay Monthly Operation
1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow		Outflow			Computed Losses (-) And Gains (+)
				Castaic Powerplant Generation	Natural Stream Flow	Castaic Powerplant Pumpback 1/	To Castaic Lake		
							Natural	Project	
Jan	1505.31	17,423	-5,647	68,406	412	71,452	0	0	-3,013
Feb	1516.49	21,769	4,346	54,431	570	48,249	0	0	-2,406
Mar	1512.82	20,286	-1,483	95,361	467	32,667	1,449	61,709	-1,486
Apr	1522.48	24,308	4,022	129,198	906	67,979	906	56,514	-683
May	1507.54	18,250	-6,058	128,914	251	119,220	251	14,637	-1,115
Jun	1525.82	25,780	7,530	139,688	52	127,199	52	8,332	3,373
Jul	1533.65	29,394	3,614	145,066	0	122,402	0	22,040	2,990
Aug	1515.34	21,299	-8,095	149,551	0	133,383	0	25,425	1,162
Sep	1528.59	27,032	5,733	152,545	0	118,422	0	29,207	817
Oct	1516.97	21,968	-5,064	118,605	0	81,547	0	42,609	487
Nov	1522.55	24,339	2,371	120,925	0	56,610	0	61,894	-50
Dec	1520.88	23,617	-722	101,046	0	60,223	0	41,513	-32
Total	- - -	- - -	547	1,403,736	2,658	1,039,353	2,658	363,880	44

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) through Castaic Power Plant.

Table 18. Castaic Lake Monthly Operation
1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Natural Inflow Storage Shares	Storage Change	Inflow			Outflow		Computed Losses (-) Gains (+)
					From Elderberry Forebay		Natural	Deliveries 1/	ReleasedTo Castaic Lagoon 2/	
					Natural	Project				
Jan	1,478.32	247,657	319	-23,053	0	0	610	23,240	812	389
Feb	1,468.12	228,494	922	-19,163	0	0	738	18,250	705	-946
Mar	1,489.06	268,741	2,130	40,247	1,449	61,709	822	20,925	81	-2,727
Apr	1,503.03	297,591	518	28,850	906	56,514	958	24,909	3,476	-1,143
May	1,502.55	296,571	-265	-1,020	251	14,637	321	14,818	1,355	-56
Jun	1,497.60	286,171	-299	-10,400	52	8,332	132	19,109	328	521
Jul	1,496.72	284,346	-275	-1,825	0	22,040	24	24,104	105	320
Aug	1,496.19	283,249	-269	-1,097	0	25,425	6	29,201	164	2,837
Sep	1,498.66	288,380	-268	5,131	0	29,207	1	25,372	458	1,753
Oct	1,490.55	271,737	-259	-16,643	0	42,609	9	60,194	0	933
Nov	1,497.16	285,258	-201	13,521	0	61,894	58	48,884	0	453
Dec	1,492.77	276,235	-99	-9,023	0	41,513	102	50,271	518	151
Total	- - -	- - -	- - -	5,525	2,658	363,880	3,781	359,277	8,002	2,485

1/ Includes 357,664 AF of project deliveries, 369 AF of recreation at Castaic Lake, and 1,244 AF to MWD for LADWP intertie exchange.

2/ Includes 1,355 AF of recreation water and 6,647 AF of project water to Castaic Lake.

Figure 18. Historical Castaic Lake Operation

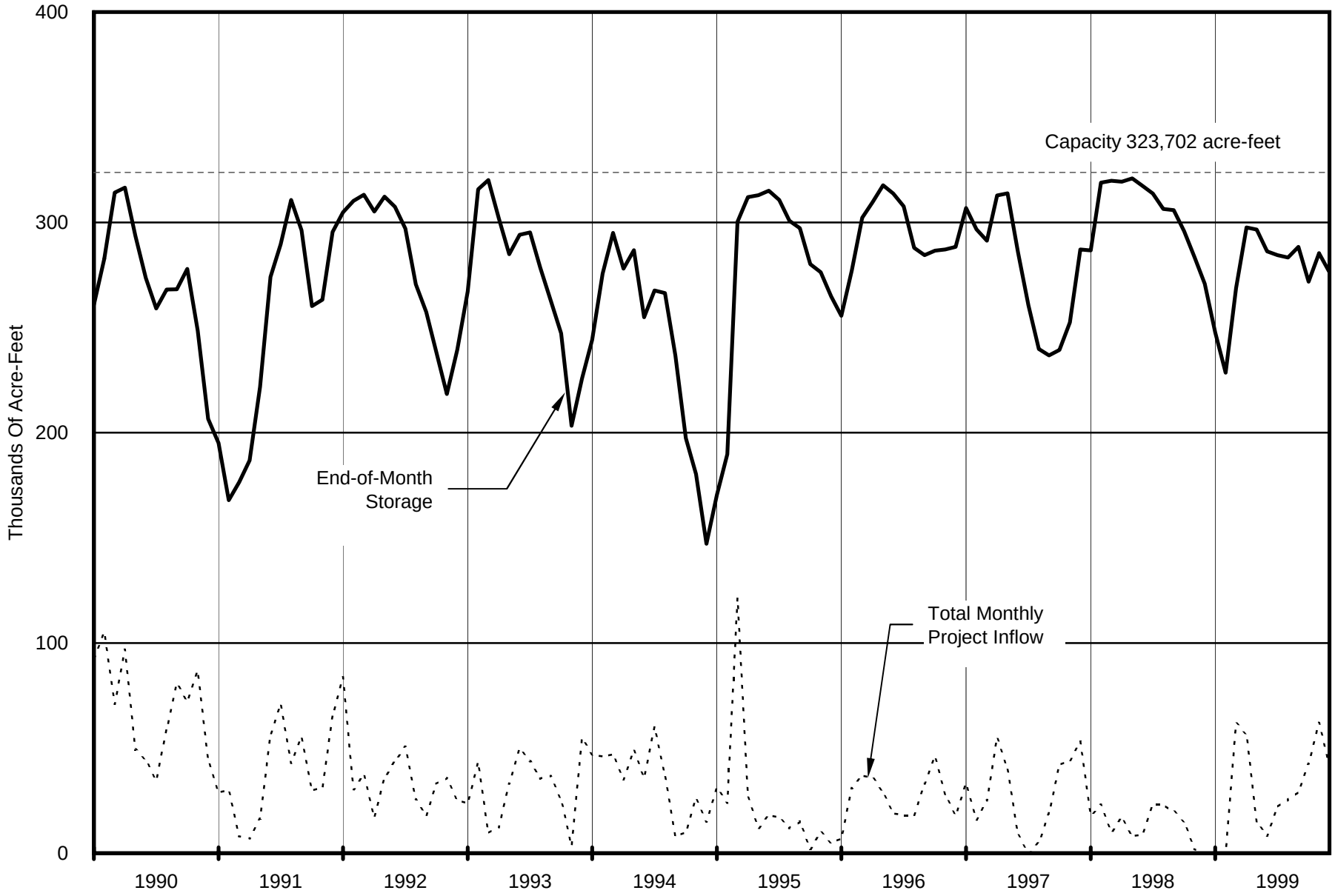


Table 19. Castaic Lagoon Monthly Operation
1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow 1/	Natural Outflow		Deliveries to Recreation	Computed Losses (-) And Gains (+)
					Release From Castaic Lagoon			
					Surface	Sub-Surface		
Jan	1136.52	5,764	21	812	612	124	55	0
Feb	1135.98	5,658	-106	705	691	84	36	0
Mar	1135.88	5,638	-20	81	0	50	51	0
Apr	1136.53	5,766	128	3,476	3,187	90	71	0
May	1136.43	5,746	-20	1,355	1,191	93	91	0
Jun	1136.11	5,683	-63	328	120	149	122	0
Jul	1135.32	5,529	-154	105	0	119	140	0
Aug	1134.79	5,426	-103	164	0	116	151	0
Sep	1135.88	5,638	212	458	0	120	126	0
Oct	1134.24	5,319	-319	0	0	193	126	0
Nov	1133.18	5,116	-203	0	0	106	97	0
Dec	1134.56	5,381	265	518	0	178	75	0
Total	- - -	- - -	-362	8,002	5,801	1,422	1,141	0

1/ Includes 1,355 AF of recreation inflow and 6,647 AF of other inflow from Castaic Lake.

Table 20. Silverwood Lake Monthly Operation

1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow			Outflow				Computed Loss (-) And Gains (+)	Total Natural Inflow Released 2/
							Project			Natural Inflow to Mojave River		
				Mojave Siphon Powerplant	Mojave Bypass Flume	Natural 1/	Delivered to CLAWA	Recreation	San Bernardino Tunnel			
Jan	3,341.70	62,596	-11,111	1,902	1,543	252	53	1	14,905	12	163	138
Feb	3,337.28	58,747	-3,849	81	556	603	42	1	5,246	9	209	9
Mar	3,350.14	70,308	11,561	37,044	1,742	268	39	2	27,823	9	380	310
Apr	3,352.03	72,102	1,794	34,637	86	775	71	2	34,330	11	710	875
May	3,349.14	69,369	-2,733	32,657	0	279	53	4	35,952	11	351	544
Jun	3,349.39	69,603	234	46,477	238	93	112	10	46,063	10	-379	249
Jul	3,351.41	71,511	1,908	65,472	0	8	170	9	62,371	10	-1,012	92
Aug	3,349.15	69,379	-2,132	59,630	460	0	168	8	61,830	10	-206	58
Sep	3,351.41	71,511	2,132	59,689	0	0	173	6	57,293	9	-76	60
Oct	3,353.74	73,745	2,234	72,982	0	0	119	6	69,780	11	-832	17
Nov	3,328.29	51,316	-22,429	10,319	24	0	53	5	33,964	11	1,261	11
Dec	3,349.07	69,304	17,988	74,076	29	13	92	1	54,178	9	-1,850	9
Total	- - -	- - -	-4,403	494,966	4,678	2,291	1,145	55	503,735	122	-1,281	2,372

1/ Houston Creek appropriation included in total.

2/ Total releases made from Mojave Siphon to Las Flores Ranch Co.plus releases from Silverwood Lake to Mojave River for Mojave W.A. The difference between this total column and the natural inflow released to Mojave River equals the Las Flores Ranch.

Figure 19. Historical Silverwood Lake Operation

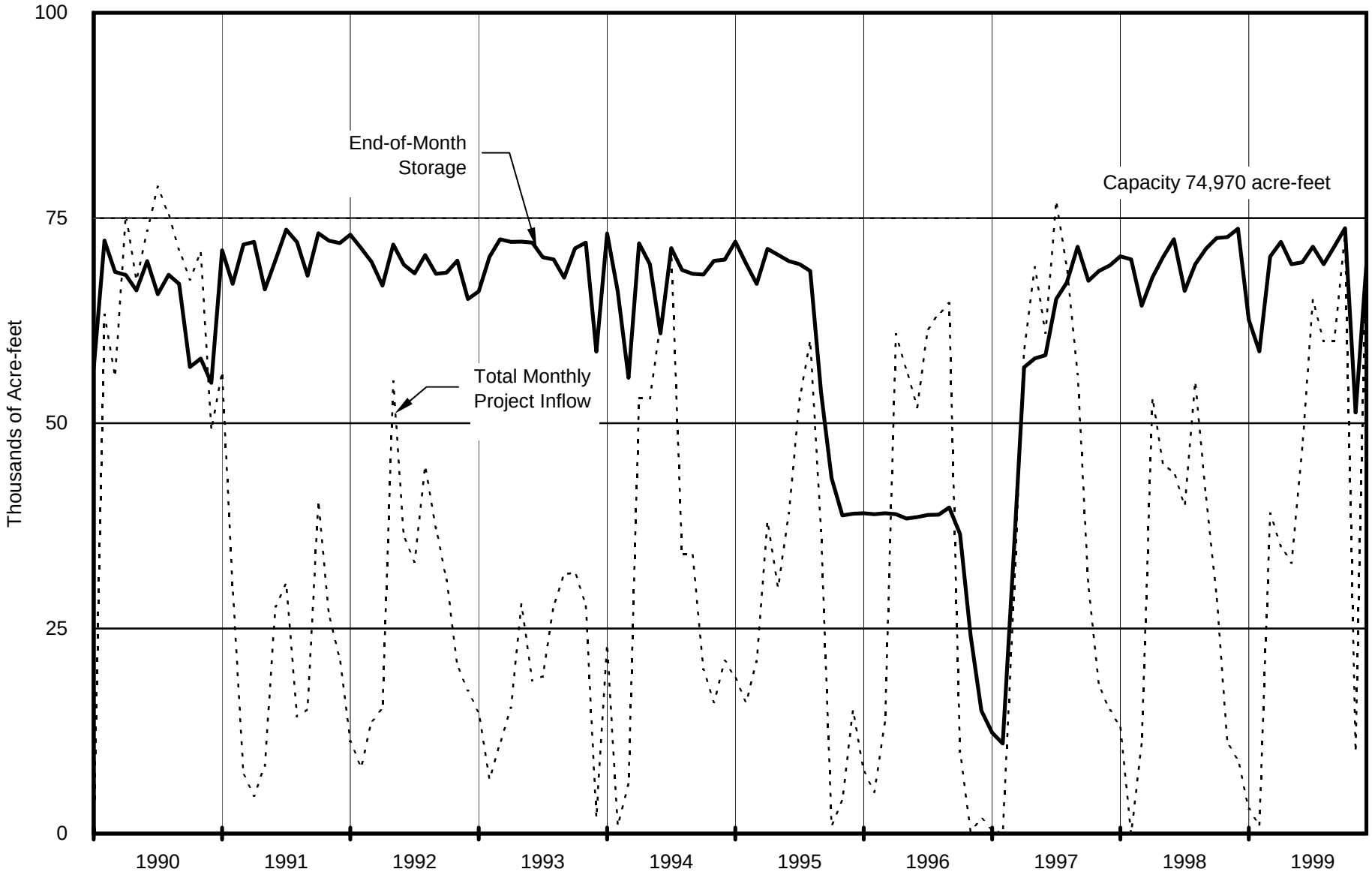


Table 21. Lake Perris Monthly Operation

1999

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Outflow			Computed Losses (-) And Gains (+)
					Project Deliveries	Recreation Deliveries	Reverse Flow	
Jan	1586.93	124,396	386	1,270	397	19	0	-468
Feb	1586.45	123,306	-1,090	626	294	12	886	-524
Mar	1586.65	123,760	454	2,011	413	17	0	-1,127
Apr	1587.13	124,852	1,092	2,244	310	14	0	-828
May	1587.32	125,286	434	1,764	324	23	0	-983
Jun	1587.44	125,560	274	1,676	298	34	0	-1,070
Jul	1587.58	125,880	320	1,960	405	42	0	-1,193
Aug	1587.43	125,537	-343	1,134	321	44	0	-1,112
Sep	1587.35	125,354	-183	1,351	336	44	0	-1,154
Oct	1586.65	123,760	-1,594	459	870	34	0	-1,149
Nov	1585.16	120,394	-3,366	678	3,797	28	0	-219
Dec	1584.91	119,833	-561	292	398	30	0	-425
Total	---	---	-4,177	15,465	8,163	341	886	-10,252

Figure 20. Historical Lake Perris Operation

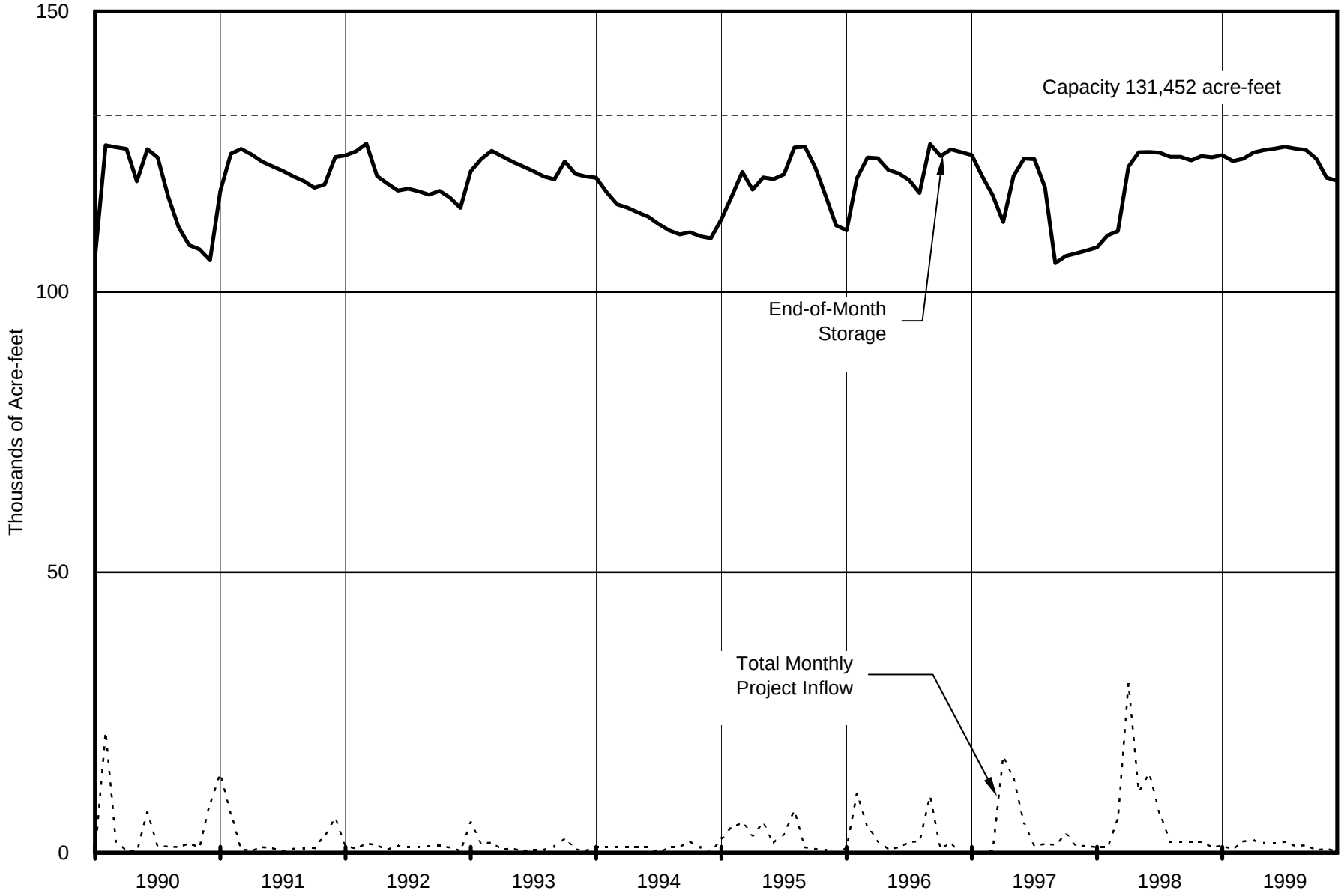


Table 22a. Summary of California Aqueduct Operation
1999
(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
DELTA FIELD DIVISION						
					Note: North Bay Aqueduct, South Bay Aqueduct, and Lake Del Valle	
North Bay Aqueduct					they are shown here	
Pumped at Barker Slough Pumping Plant	2,673	1,400	916	733	2,966	4,110
Deliveries (Travis & Fairfield/Vacaville)	108	56	61	57	920	1,552
Pumped at Cordelia Pumping Plant	2,469	1,298	832	653	1,961	2,396
Deliveries (Benicia, Vallejo, A.C. 1&2, & Napa)	2,469	1,298	832	653	1,961	2,396
Computed Losses (-), Gains (+)	-96	-46	-23	-23	-85	-162
California Aqueduct						
Pumped at Banks Pumping Plant	85,366	52,203	182,800	185,666	99,261	59,277
Pumped at South Bay Pumping Plant	6,110	5,807	3,819	4,353	7,562	10,849
Delivered to Contracting Agencies	44	70	191	415	817	1,086
Change in Storage	-312	358	572	-865	71	1,047
Outflow at Check 12	76,906	45,472	177,243	180,860	89,609	43,923
Computed Losses (-), Gains (+)	-2,618	-496	-975	-903	-1,202	-2,372
South Bay Aqueduct						
Inflow from Lake Del Valle (Flood Control)	0	0	0	0	0	0
Pumped at South Bay Pumping Plant	6,110	5,807	3,819	4,353	7,562	10,849
Inflow from Lake Del Valle (Natural)	77	0	0	0	462	118
Inflow from Lake Del Valle (Project)	0	0	0	0	0	0
Inflow from Lake Del Valle (Contractor's Stored)	0	0	0	0	0	500
Outflow, To Lake Del Valle	328	1,479	0	0	0	64
Outflow, Deliveries	5,849	4,318	3,809	4,235	8,011	11,393
Computed Losses (-), Gains (+)	-10	-10	-10	-118	-13	-10
Lake Del Valle Operation:						
Inflow from South Bay Aqueduct	328	1,479	0	0	0	64
Natural inflow	1,841	7,348	2,175	2,674	500	118
Releases to South Bay Aqueduct	77	0	0	0	462	618
Releases to Arroyo Valle	0	0	0	0	0	0
Delivered to EBRP District	2	1	4	5	12	21
End-of-Month Storage	26,228	35,000	37,066	39,541	39,295	38,488
Change in Storage	2,050	8,772	2,066	2,475	-246	-807
Computed Losses (-), Gains (+)	-40	-54	-105	-194	-272	-350
SAN LUIS FIELD DIVISION						
O'Neill Forebay Operation						
End-of-Month Storage	45,420	46,705	45,603	46,784	48,517	45,106
Inflow, California Aqueduct	76,906	45,472	177,243	180,860	89,609	43,923
Inflow, O'Neill P.- G. Plant	135,047	168,458	177,377	41,669	701	17,170
Inflow, Gianelli P.- G. Plant	38,125	1,620	31,045	109,667	398,450	548,357
Pump-in/sideflows/Sisk Dam spill	0	0	0	0	0	0
Delivered to Dept. of Fish and Game (State)	29	26	18	39	41	120
Delivered to Dept. of Fish and Game (Fed.)	23	21	15	32	34	98
Delivered to Dept. of Parks & Rec. (State)	1	1	1	6	10	13
Delivered to Dept. of Parks & Rec. (Fed.)	1	1	0	5	8	11
Delivered to Fed. Customers	282	1,132	783	1,041	1,599	2,761
Outflow, O'Neill P.- G. Plant	6,602	0	0	23,524	81,563	25,199
Outflow, Gianelli P.- G. Plant	92,111	74,206	91,410	8,906	0	0
Outflow, Dos Amigos P.P.	157,987	141,376	296,883	290,604	394,985	579,449
Change in Storage	602	1,285	-1,102	1,181	1,733	-3,411
Computed Losses (-), Gains (+)	7,560	2,498	2,343	-6,859	-8,787	-5,210
San Luis Reservoir Operation						
State End-of-Month Storage	1,104,033	1,097,239	1,061,810	1,011,660	863,263	555,482
Total End-of-Month Storage	1,929,319	1,985,676	2,027,835	1,913,855	1,496,796	936,402
Inflow, Gianelli P.- G. Plant	92,111	74,206	91,410	8,906	0	0
Outflow, Gianelli P. - G. Plant	38,125	1,620	31,045	109,667	398,450	548,357
Delivered to Dept. of Parks & Rec. (Fed.)	0	0	1	0	1	0
Delivered to Dept. of Parks & Rec. (State)	1	0	0	1	0	1
Pacheco Tunnel Diversion	9,995	8,348	10,945	11,208	16,839	17,863
Change in Storage (Total)	31,133	56,357	42,159	-113,980	-417,059	-560,394
Computed Losses (-), Gains (+)	-12,857	-7,881	-7,260	-2,010	-1,769	5,827

Table 22a. Summary of California Aqueduct Operations

1999

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							DELTA FIELD DIVISION
are not within the Edmond G. Brown California Aqueduct, for completeness.							
							North Bay Aqueduct
6,053	5,822	4,955	5,125	3,588	4,238	42,579	Pumped at Barker Slough Pumping Plant
2,883	3,004	2,660	2,335	798	757	15,191	Deliveries (Travis & Fairfield/Vacaville)
2,775	2,450	1,915	2,432	2,525	3,160	24,866	Pumped at Cordelia Pumping Plant
2,775	2,450	1,915	2,432	2,525	3,160	24,866	Deliveries (Benicia, Vallejo, A.C. 1&2, & Napa)
-395	-368	-380	-358	-265	-321	-2,522	Computed Losses (-), Gains (+)
							California Aqueduct
376,107	409,354	408,580	303,546	310,792	233,883	2,706,835	Pumped at Banks Pumping Plant
15,105	16,864	16,134	11,764	6,963	11,893	117,223	Pumped at South Bay Pumping Plant
1,183	822	292	335	64	159	5,478	Delivered to Contracting Agencies
-144	-44	-670	-591	845	21	288	Change in Storage
349,943	377,784	376,589	276,802	288,454	212,993	2,496,578	Outflow at Check 12
-10,020	-13,928	-16,235	-15,236	-14,466	-8,817	-87,268	Computed Losses (-), Gains (+)
							South Bay Aqueduct
0	0	0	0	0	0	0	Inflow from Lake Del Valle (Flood Control)
15,105	16,864	16,134	11,764	6,963	11,893	117,223	Pumped at South Bay Pumping Plant
69	0	80	242	156	127	1,331	Inflow from Lake Del Valle (Natural)
0	846	946	3,938	3,781	541	10,052	Inflow from Lake Del Valle (Project)
647	0	0	0	0	102	1,249	Inflow from Lake Del Valle (Contractor's Stored)
107	47	42	419	0	1,576	4,062	Outflow, To Lake Del Valle
15,676	17,653	17,103	15,512	10,890	11,064	125,513	Outflow, Deliveries
-38	-10	-15	-13	-10	-23	-280	Computed Losses (-), Gains (+)
							Lake Del Valle Operation:
107	47	42	419	0	1,576	4,062	Inflow from South Bay Aqueduct
69	45	80	242	156	127	15,375	Natural inflow
716	846	1,026	4,180	3,937	770	12,632	Releases to South Bay Aqueduct
0	0	0	0	0	0	0	Releases to Arroyo Valle
24	20	22	15	8	5	139	Delivered to EBRP District
37,486	36,340	35,078	31,237	27,334	28,167	- - -	End-of-Month Storage
-1,002	-1,146	-1,262	-3,841	-3,903	833	3,989	Change in Storage
-438	-372	-336	-307	-114	-95	-2,677	Computed Losses (-), Gains (+)
							SAN LUIS FIELD DIVISION
							O'Neill Forebay Operation
49,314	50,673	43,749	42,299	44,427	50,726	- - -	End-of-Month Storage
349,943	377,784	376,589	276,802	288,454	212,993	2,496,578	Inflow, California Aqueduct
29,189	70,917	90,434	136,748	189,813	132,049	1,189,572	Inflow, O'Neill P.- G. Plant
324,361	158,772	1,859	61,100	8,729	58,108	1,740,193	Inflow, Gianelli P.- G. Plant
0	0	0	0	0	0	0	Pump-in/sideflows/Sisk Dam spill
92	124	119	95	40	65	806	Delivered to Dept. of Fish and Game (State)
75	101	97	77	32	54	660	Delivered to Dept. of Fish and Game (Fed.)
13	12	10	15	4	1	86	Delivered to Dept. of Parks & Rec. (State)
11	10	8	12	3	0	71	Delivered to Dept. of Parks & Rec. (Fed.)
3,784	2,560	940	743	91	137	15,853	Delivered to Fed. Customers
969	0	0	0	0	5,306	143,163	Outflow, O'Neill P.- G. Plant
12,800	90,866	213,358	171,944	297,150	188,810	1,241,561	Outflow, Gianelli P.- G. Plant
685,328	523,988	279,176	309,673	198,799	215,050	4,073,298	Outflow, Dos Amigos P.P.
4,208	1,359	-6,924	-1,450	2,128	6,299	5,908	Change in Storage
3,787	11,547	17,902	6,459	11,251	12,572	55,063	Computed Losses (-), Gains (+)
							San Luis Reservoir Operation
476,177	451,340	591,805	573,857	683,525	717,432	- - -	State End-of-Month Storage
611,617	520,283	702,409	801,279	1,073,901	1,187,142	- - -	Total End-of-Month Storage
12,800	90,866	213,358	171,944	297,150	188,810	1,241,561	Inflow, Gianelli P.- G. Plant
324,361	158,772	1,859	61,100	8,729	58,108	1,740,193	Outflow, Gianelli P. - G. Plant
1	0	1	1	0	0	5	Delivered to Dept. of Parks & Rec. (Fed.)
0	1	0	1	1	1	7	Delivered to Dept. of Parks & Rec. (State)
16,032	17,156	11,798	9,609	3,563	6,452	139,808	Pacheco Tunnel Diversion
-324,785	-91,334	182,126	98,870	272,622	113,241	-711,044	Change in Storage (Total)
2,809	-6,271	-17,574	-2,363	-12,235	-11,008	-72,592	Computed Losses (-), Gains (+)

Table 22b. Summary of California Aqueduct Operation

1999

(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
SAN LUIS FIELD DIVISION (Cont.)						
California Aqueduct (Pools 14 thru 21)	111,910	93,136	76,741	82,528	162,620	244,248
Inflow, Dos Amigos P.P.(State)	42,568	34,242	213,619	222,939	231,261	355,430
Inflow, Dos Amigos P.P.(Fed. and Other)	115,419	107,134	83,264	67,665	163,724	224,019
Total Inflow, Dos Amigos P.P.	157,987	141,376	296,883	290,604	394,985	579,449
Flow into Aqueduct	0	0	0	0	0	0
Delivered to Dept. of Fish and Game (State)	0	0	1	1	0	1
Delivered to Dept. of Fish and Game (Fed.)	0	0	0	0	1	0
Miscellaneous Outflow (Phase 1)	0	0	3	3	0	0
Delivered to Fed. Customers (State Transfers)	0	0	0	5,000	16,000	1,000
Delivered to Fed. Customers	111,910	93,136	76,738	77,525	146,620	243,248
Outflow, Check 21 (State)	44,859	51,124	225,977	208,896	240,019	342,886
Outflow, Check 21 (Fed.)	254	0	0	0	645	61
Change in Storage	-1,231	1,907	-477	327	-612	1,795
Computed Losses (-), Gains (+)	-2,195	4,791	5,359	1,148	7,688	9,542
SAN JOAQUIN FIELD DIVISION						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (State)	44,859	51,124	225,977	208,896	240,019	342,886
Inflow, Check 21 (Fed.)	254	0	0	0	645	61
Total Inflow, Check 21	45,113	51,124	225,977	208,896	240,664	342,947
Kern River Intertie	0	0	0	0	0	0
Delivered to Contracting State Agencies	33,167	32,013	85,780	86,707	132,809	207,611
Delivered to Fed. Customers	254	0	0	0	645	61
Friant CVP Inflow	0	0	0	0	0	0
Outflow, Buena Vista P.P.	9,202	10,096	125,493	106,921	84,077	102,197
Coastal Br. Diversion	3,427	5,199	8,035	9,744	13,913	19,795
Change in Storage	-469	147	-880	294	56	-38
Computed Losses (-), Gains (+)	468	-3,669	-7,549	-5,230	-9,164	-13,321
California Aqueduct, Buena Vista P.P. to Teerink Pumping Plant						
Inflow, Buena Vista P.P.	9,202	10,096	125,493	106,921	84,077	102,197
Delivered to Contracting State Agencies	4,150	6,361	10,297	7,654	13,592	20,423
W.R.M.W.S.D. Pumpback	0	0	0	0	0	0
Outflow, Teerink Pumping Plant	4,779	3,507	118,799	102,011	72,262	83,601
Change in Storage	175	-101	203	83	-282	342
Computed Losses (-), Gains (+)	-98	-329	3,806	2,827	1,495	2,169
California Aqueduct, Teerink Pumping Plant to Chrisman Pumping Plant						
Inflow, Teerink Pumping Plant	4,779	3,507	118,799	102,011	72,262	83,601
Delivered to Contracting State Agencies	370	343	1,990	2,208	5,008	6,891
Outflow, Chrisman Pumping Plant	4,265	2,947	113,591	97,873	65,661	75,122
Change in Storage	24	14	11	-66	26	21
Computed Losses (-), Gains (+)	-120	-204	-3,207	-1,996	-1,567	-1,567
California Aqueduct, Chrisman Pumping Plant to Edmonston Pumping Plant						
Inflow, Chrisman Pumping Plant	4,265	2,947	113,591	97,873	65,661	75,122
Delivered to Contracting State Agencies	564	357	610	929	2,957	4,335
Outflow, Edmonston Pumping Plant	3,842	2,670	112,550	96,516	62,993	70,677
Change in Storage	21	-8	-84	51	9	-48
Computed Losses (-), Gains (+)	162	72	-515	-377	298	-158
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	3,427	5,199	8,035	9,744	13,913	19,795
B.M.W.S.D. Pumpback	0	0	0	0	0	0
Delivered to Contracting State Agencies	3,409	5,108	8,016	9,527	14,123	18,904
Delivered to Fed. Customers	0	0	0	0	0	0
Change in Storage	-29	12	4	-16	10	18
Computed Losses (-), Gains (+)	-47	-79	-15	-233	220	-873

Table 22b. Summary of California Aqueduct Operations

1999

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							SAN LUIS FIELD DIVISION (Cont.)
265,470	171,738	50,077	49,545	29,795	33,368	1,371,176	California Aqueduct (Pools 14 thru 21)
431,547	402,735	240,473	286,523	172,671	173,836	2,807,844	Inflow, Dos Amigos P.P.(State)
253,781	121,253	38,703	23,150	26,128	41,214	1,265,454	Inflow, Dos Amigos P.P.(Fed. and Other)
685,328	523,988	279,176	309,673	198,799	215,050	4,073,298	Total Inflow, Dos Amigos P.P.
0	0	0	0	0	0	0	Flow into Aqueduct
0	1	0	1	0	1	6	Delivered to Dept. of Fish and Game (State)
1	0	1	0	1	0	4	Delivered to Dept. of Fish and Game (Fed.)
5	0	18	0	0	0	29	Miscellaneous Outflow (Phase 1)
19,000	48,276	12,406	10,600	4,080	14,607	130,969	Delivered to Fed. Customers (State Transfers)
246,465	123,462	37,653	38,945	25,715	18,761	1,240,178	Delivered to Fed. Customers
425,988	362,477	235,863	267,736	173,385	179,814	2,759,024	Outflow, Check 21 (State)
4,699	3,401	6,481	7,739	0	0	23,280	Outflow, Check 21 (Fed.)
441	-597	-986	-319	174	587	1,009	Change in Storage
11,271	13,032	12,260	15,029	4,556	-1,280	81,201	Computed Losses (-), Gains (+)
							SAN JOAQUIN FIELD DIVISION
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
425,988	362,477	235,863	267,736	173,385	179,814	2,759,024	Inflow, Check 21 (State)
4,699	3,401	6,481	7,739	0	0	23,280	Inflow, Check 21 (Fed.)
430,687	365,878	242,344	275,475	173,385	179,814	2,782,304	Total Inflow, Check 21
0	0	0	0	0	0	0	Kern River Intertie
248,072	204,071	103,722	102,539	84,846	45,961	1,367,298	Delivered to Contracting State Agencies
4,699	3,401	6,481	7,739	0	0	23,280	Delivered to Fed. Customers
0	0	0	0	0	0	0	Friant CVP Inflow
138,257	132,537	115,509	147,574	82,293	126,644	1,180,800	Outflow, Buena Vista P.P.
21,610	16,879	10,012	7,416	2,705	3,779	122,514	Coastal Br. Diversion
1,244	-651	-87	170	-30	673	429	Change in Storage
-16,805	-9,641	-6,707	-10,037	-3,571	-2,758	-87,983	Computed Losses (-), Gains (+)
							California Aqueduct, Buena Vista P.P. to Teerink Pumping Plant
138,257	132,537	115,509	147,574	82,293	126,644	1,180,800	Inflow, Buena Vista P.P.
21,908	16,850	7,355	5,501	2,465	3,662	120,218	Delivered to Contracting State Agencies
0	0	0	0	0	0	0	W.R.M.W.S.D. Pumpback
120,118	118,619	111,943	146,545	81,675	125,555	1,089,414	Outflow, Teerink Pumping Plant
-5	57	-243	280	-19	97	586	Change in Storage
3,764	2,989	3,546	4,752	1,829	2,670	29,418	Computed Losses (-), Gains (+)
							California Aqueduct, Teerink Pumping Plant to Chrisman Pumping Plant
120,118	118,619	111,943	146,545	81,675	125,555	1,089,414	Inflow, Teerink Pumping Plant
7,573	4,913	2,751	3,076	1,233	445	36,801	Delivered to Contracting State Agencies
110,450	111,969	106,849	141,177	79,248	121,641	1,030,793	Outflow, Chrisman Pumping Plant
-21	-38	62	-5	-29	56	54	Change in Storage
-2,116	-1,775	-2,281	-2,297	-1,223	-3,413	-21,766	Computed Losses (-), Gains (+)
							California Aqueduct, Chrisman Pumping Plant to Edmonston Pumping Plant
110,450	111,969	106,849	141,177	79,248	121,641	1,030,793	Inflow, Chrisman Pumping Plant
4,752	4,322	3,561	3,626	1,042	332	27,387	Delivered to Contracting State Agencies
104,895	107,722	102,701	135,774	77,806	122,472	1,000,618	Outflow, Edmonston Pumping Plant
106	-112	-68	116	65	14	61	Change in Storage
-698	-37	-655	-1,662	-335	1,177	-2,727	Computed Losses (-), Gains (+)
							Coastal Branch, California Aqueduct
21,610	16,879	10,012	7,416	2,705	3,779	122,514	Inflow, Las Perillas P.P.
0	0	0	0	0	0	0	B.M.W.S.D. Pumpback
20,168	16,315	10,350	7,692	2,703	3,746	120,061	Delivered to Contracting State Agencies
0	0	0	0	0	0	0	Delivered to Fed. Customers
-10	9	-9	0	-7	31	12	Change in Storage
-1,452	-555	329	276	-9	-2	-2,441	Computed Losses (-), Gains (+)

Table 22c. Summary of California Aqueduct Operation

1999

(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
SOUTHERN FIELD DIVISION						
California Aqueduct, Edmonston Pumping Plant to Junction of West Branch						
Inflow, Edmonston Pumping Plant	3,842	2,670	112,550	96,516	62,993	70,677
Outflow, West Branch	72	717	64,143	53,903	17,445	10,797
Outflow, East Branch	3,746	1,953	48,363	42,583	45,493	59,841
Change in Storage	23	-4	3	-9	8	-4
Computed Losses (-), Gains (+)	-1	-4	-41	-39	-47	-43
California Aqueduct, Junction of West Branch to Pearblossom P.P.						
Inflow (Aqueduct)	3,746	1,953	48,363	42,583	45,493	59,841
Inflow (L.A.D.W.P.)	1,244	0	0	0	0	0
Delivered to Contracting Agencies	2,532	1,989	4,407	5,316	9,261	10,947
Outflow, Pearblossom P.P.	2,177	0	40,709	34,173	32,830	46,063
Change in Storage	246	-346	243	180	-47	-387
Computed Losses (-), Gains (+)	-35	-310	-3,004	-2,914	-3,449	-3,218
California Aqueduct, Pearblossom P.P. to Silverwood Lake						
Inflow, Pearblossom P.P.	2,177	0	40,709	34,173	32,830	46,063
Deliveries (Exchange of Natural Inflow)	113	8	129	279	221	678
Exchange of Natural Inflow (Los Flores T.O.)	126	0	301	864	533	239
Outflow to Silverwood Lake	3,445	637	38,786	34,723	32,657	46,715
Change in Storage	-1,425	-869	2,859	-750	407	-59
Computed Losses (-), Gains (+)	82	-224	1,366	943	988	1,510
Silverwood Lake Operation						
Inflow, Project	3,445	637	38,786	34,723	32,657	46,715
Inflow, Natural	252	603	268	775	279	93
Delivered to Contracting Agencies	53	42	39	71	53	112
Recreation Deliveries	1	1	2	2	4	10
Outflow, Natural Inflow Released	12	9	9	11	11	10
Outflow, At San Bernardino Tunnel	14,905	5,246	27,823	34,330	35,952	46,063
Change in storage	-11,111	-3,849	11,561	1,794	-2,733	234
Computed Losses (-), Gains (+)	163	209	380	710	351	-379
California Aqueduct, Silverwood Lake to Lake Perris						
Inflow, SBMWD Reverse Flow	0	0	0	0	0	0
Inflow, San Bernardino Tunnel	14,905	5,246	27,823	34,330	35,952	46,063
Inflow, From 28J	0	886	0	0	0	0
Delivered to Contracting Agencies	13,915	5,616	25,436	32,637	34,326	44,226
Outflow to Lake Perris	1,270	626	2,011	2,244	1,764	1,676
Change in Storage	-290	-119	366	-562	-148	151
Operational Losses (-), Gains (+)	-10	-9	-10	-11	-10	-10
Lake Perris Operation						
Inflow	1,270	626	2,011	2,244	1,764	1,676
Delivered to Contracting Agencies	397	294	413	310	324	298
Recreation Deliveries	19	12	17	14	23	34
Outflow (Reverse Flow)	0	886	0	0	0	0
Change in Storage	386	-1,090	454	1,092	434	274
Computed Losses (-), Gains (+)	-468	-524	-1,127	-828	-983	-1,070

Table 22c. Summary of California Aqueduct Operations

1999

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							SOUTHERN FIELD DIVISION
							California Aqueduct, Edmonston Pumping Plant to Junction of West Branch
104,895	107,722	102,701	135,774	77,806	122,472	1,000,618	Inflow, Edmonston Pumping Plant
24,522	33,243	31,287	51,636	63,239	42,156	393,160	Outflow, West Branch
80,331	74,423	71,383	84,098	14,559	80,293	607,066	Outflow, East Branch
0	2	-5	11	-6	0	19	Change in Storage
-42	-54	-36	-29	-14	-23	-373	Computed Losses (-), Gains (+)
							California Aqueduct, Junction of West Branch to Pearblossom P.P.
80,331	74,423	71,383	84,098	14,559	80,293	607,066	Inflow (Aqueduct)
0	0	0	0	0	0	1,244	Inflow (L.A.D.W.P.)
12,215	11,731	10,360	8,002	3,869	3,503	84,132	Delivered to Contracting Agencies
64,174	59,060	58,656	73,127	10,320	75,091	496,380	Outflow, Pearblossom P.P.
846	-332	-289	879	-650	43	386	Change in Storage
-3,096	-3,964	-2,656	-2,090	-1,020	-1,656	-27,412	Computed Losses (-), Gains (+)
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
64,174	59,060	58,656	73,127	10,320	75,091	496,380	Inflow, Pearblossom P.P.
779	118	82	986	982	2,330	6,705	Deliveries (Exchange of Natural Inflow)
82	48	51	6	0	0	2,250	Exchange of Natural Inflow (Los Flores T.O.)
65,472	60,090	59,689	72,982	10,343	74,105	499,644	Outflow to Silverwood Lake
27	-475	140	1,608	-1,207	122	378	Change in Storage
2,186	721	1,306	2,455	-202	1,466	12,597	Computed Losses (-), Gains (+)
							Silverwood Lake Operation
65,472	60,090	59,689	72,982	10,343	74,105	499,644	Inflow, Project
8	0	0	0	0	13	2,291	Inflow, Natural
170	168	173	119	53	92	1,145	Delivered to Contracting Agencies
9	8	6	6	5	1	55	Recreation Deliveries
10	10	9	11	11	9	122	Outflow, Natural Inflow Released
62,371	61,830	57,293	69,780	33,964	54,178	503,735	Outflow, At San Bernardino Tunnel
1,908	-2,132	2,132	2,234	-22,429	17,988	-4,403	Change in storage
-1,012	-206	-76	-832	1,261	-1,850	-1,281	Computed Losses (-), Gains (+)
							California Aqueduct, Silverwood Lake to Lake Perris
0	0	0	0	0	0	0	Inflow, SBMWD Reverse Flow
62,371	61,830	57,293	69,780	33,964	54,178	503,735	Inflow, San Bernardino Tunnel
0	0	0	0	0	0	886	Inflow, From 28J
60,493	60,620	55,958	69,368	33,301	53,728	489,624	Delivered to Contracting Agencies
1,960	1,134	1,351	459	678	292	15,465	Outflow to Lake Perris
-93	66	-26	-58	-26	147	-592	Change in Storage
-11	-10	-10	-11	-11	-11	-124	Operational Losses (-), Gains (+)
							Lake Perris Operation
1,960	1,134	1,351	459	678	292	15,465	Inflow
405	321	336	870	3,797	398	8,163	Delivered to Contracting Agencies
42	44	44	34	28	30	341	Recreation Deliveries
0	0	0	0	0	0	886	Outflow (Reverse Flow)
320	-343	-183	-1,594	-3,366	-561	-4,177	Change in Storage
-1,193	-1,112	-1,154	-1,149	-219	-425	-10,252	Computed Losses (-), Gains (+)

Table 22d. Summary of California Aqueduct Operation

1999

(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
SOUTHERN FIELD DIVISION (Cont.)						
West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.						
Inflow	72	717	64,143	53,903	17,445	10,797
Outflow, Oso Pumping Plant	0	714	64,009	53,809	17,280	10,676
Change in Storage	70	-10	9	-27	23	-12
Computed Losses (-), Gains (+)	-2	-13	-125	-121	-142	-133
West Branch California Aqueduct Oso P.P. to Pyramid Lake						
Inflow, Oso P.P.	0	714	64,009	53,809	17,280	10,676
Deliveries	0	0	0	0	0	0
Outflow Through Warne to Pyramid Lake	0	0	65,474	53,549	16,375	10,568
Change in Storage	22	515	-1,281	-723	752	-369
Operational Losses (-), Gains (+)	22	-199	184	-983	-153	-477
Pyramid Lake Operation						
Inflow, Project	0	0	65,474	53,549	16,375	10,568
Inflow, Natural	1,872	2,008	2,228	3,613	1,686	958
Inflow, Pumpback from Elderberry Forebay	71,452	48,249	32,667	67,979	119,220	127,199
Deliveries (Fish Enhancement)	0	0	0	0	0	0
Deliveries	0	0	0	0	0	0
Delivered to Dept. of Parks and Rec. (State)	0	0	0	0	0	3
Outflow, Pyramid Diversion	1,624	1,776	1,770	2,953	1,502	1,522
Outflow, Angeles Tunnel	68,406	54,431	95,361	129,198	128,914	139,688
Change in Storage	6,012	-4,224	6,210	-6,123	6,238	-8,212
Computed Losses (-), Gains (+)	2,718	1,726	2,972	887	-627	-5,724
Elderberry Forebay Operation						
Inflow, Project through Castaic P-G Plant	68,406	54,431	95,361	129,198	128,914	139,688
Inflow, Natural	412	570	467	906	251	52
Outflow, Pumpback to Pyramid Lake	71,452	48,249	32,667	67,979	119,220	127,199
Outflow, Released to Castaic Lake /1	0	0	63,158	57,420	14,888	8,384
Change in Storage	-5,647	4,346	-1,483	4,022	-6,058	7,530
Computed Losses (-), Gains (+)	-3,013	-2,406	-1,486	-683	-1,115	3,373
Castaic Lake Operation						
Inflow, 1/	0	0	63,158	57,420	14,888	8,384
Inflow, Natural	610	738	822	958	321	132
Delivered to Contracting Agencies	21,965	18,225	20,901	24,885	14,791	19,077
Deliveries to Recreation	31	25	24	24	27	32
Outflow, (LADWP)	1,244	0	0	0	0	110
Outflow, Project to Castaic Lagoon	812	705	81	3,476	1,355	218
Change in Storage	-23,053	-19,163	40,247	28,850	-1,020	-10,400
Computed Losses (-), Gains (+)	389	-946	-2,727	-1,143	-56	521
Castaic Lagoon Operation						
Inflow (Recreation Deliveries)	0	0	0	0	0	110
Inflow, Project	812	705	81	3,476	1,355	218
Inflow, Non-project	0	0	0	0	0	0
Outflow	736	775	50	3,277	1,284	269
Deliveries to Recreation (State)	55	36	51	71	91	122
Change in Storage	21	-106	-20	128	-20	-63
Computed Losses (-), Gains (+)	0	0	0	0	0	0

Table 22d. Summary of California Aqueduct Operations

1999

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							SOUTHERN FIELD DIVISION (Cont.)
							West Branch California Aqueduct
							Tehachapi Afterbay to Oso P.P.
24,522	33,243	31,287	51,636	63,239	42,156	393,160	Inflow
24,394	33,074	31,190	51,518	63,214	42,089	391,967	Outflow, Oso Pumping Plant
0	5	-13	33	-17	-2	59	Change in Storage
-128	-164	-110	-85	-42	-69	-1,134	Computed Losses (-), Gains (+)
							West Branch California Aqueduct
							Oso P.P. to Pyramid Lake
24,394	33,074	31,190	51,518	63,214	42,089	391,967	Inflow, Oso P.P.
0	0	0	0	0	0	0	Deliveries
24,061	33,422	31,383	50,944	63,362	42,595	391,733	Outflow Through Warne to Pyramid Lake
-191	-784	-197	612	-153	-644	-2,441	Change in Storage
-524	-436	-4	38	-5	-138	-2,675	Operational Losses (-), Gains (+)
							Pyramid Lake Operation
24,061	33,422	31,383	50,944	63,362	42,595	391,733	Inflow, Project
934	535	514	586	728	831	16,493	Inflow, Natural
122,402	133,383	118,422	81,547	56,610	60,223	1,039,353	Inflow, Pumpback from Elderberry Forebay
0	0	0	0	0	0	0	Deliveries (Fish Enhancement)
0	0	0	0	0	0	0	Deliveries
4	5	5	1	0	0	18	Delivered to Dept. of Parks and Rec. (State)
1,556	1,577	1,530	1,024	571	619	18,024	Outflow, Pyramid Diversion
145,066	149,551	152,545	118,605	120,925	101,046	1,403,736	Outflow, Angeles Tunnel
-4,766	9,348	-8,887	9,429	-3,735	-981	309	Change in Storage
-5,537	-6,859	-5,126	-4,018	-2,939	-2,965	-25,492	Computed Losses (-), Gains (+)
							Elderberry Forebay Operation
145,066	149,551	152,545	118,605	120,925	101,046	1,403,736	Inflow, Project through Castaic P-G Plant
0	0	0	0	0	0	2,658	Inflow, Natural
122,402	133,383	118,422	81,547	56,610	60,223	1,039,353	Outflow, Pumpback to Pyramid Lake
							Outflow, Released to
22,040	25,425	29,207	42,609	61,894	41,513	366,538	Castaic Lake /1
3,614	-8,095	5,733	-5,064	2,371	-722	547	Change in Storage
2,990	1,162	817	487	-50	-32	44	Computed Losses (-), Gains (+)
							Castaic Lake Operation
22,040	25,425	29,207	42,609	61,894	41,513	366,538	Inflow, 1/
24	6	1	9	58	102	3,781	Inflow, Natural
24,070	29,150	25,332	60,166	48,864	50,238	357,664	Delivered to Contracting Agencies
34	51	40	28	20	33	369	Deliveries to Recreation
105	164	458	0	0	518	2,599	Outflow, (LADWP)
0	0	0	0	0	0	6,647	Outflow, Project to Castaic Lagoon
-1,825	-1,097	5,131	-16,643	13,521	-9,023	5,525	Change in Storage
320	2,837	1,753	933	453	151	2,485	Computed Losses (-), Gains (+)
							Castaic Lagoon Operation
105	164	458	0	0	518	1,355	Inflow (Recreation Deliveries)
0	0	0	0	0	0	6,647	Inflow, Project
0	0	0	0	0	0	0	Inflow, Non-project
119	116	120	193	106	178	7,223	Outflow
140	151	126	126	97	75	1,141	Deliveries to Recreation (State)
-154	-103	212	-319	-203	265	-362	Change in Storage
0	0	0	0	0	0	0	Computed Losses (-), Gains (+)

1/ Includes 363,880 AF Project water and 2,658 AF of natural inflow from Elderberry Forebay.

Glossary

accretion - the water accumulated and retained within a service area.

acre-foot (AF) - a quantity or volume of water covering one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

active storage capacity - the total usable reservoir capacity available for seasonal or cyclic water storage. It is gross reservoir capacity minus inactive storage capacity.

afterbay - a reservoir that regulates fluctuating discharges from a hydroelectric power plant or a pumping plant.

alluvium - a stratified bed of sand, gravel, silt, and clay deposited by flowing water.

aquifer - a geologic formation that stores and transmits water and yields significant quantities of water to wells and springs.

average annual runoff - the average value of annual runoff amounts for a specified area calculated for a selected period of record that represents average hydrologic conditions.

balanced water conditions - exist when upstream reservoir storage releases, plus other inflows, approximately equal the water supply needed to (1) satisfy Sacramento Valley and Sacramento-San Joaquin Delta in-basin needs, including Delta water quality requirements, and (2) meet export needs.

benthic invertebrates - aquatic animals without backbones that dwell on or in the bottom sediments of fresh or salt water. Examples: clams, crayfish, and a wide variety of worms.

biota - all living organisms of a region, as in a stream or other body of water.

brackish water - water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water.

carriage water - the amount of water needed above an increased export so as to not increase salinity in the Delta.

conjunctive use - the operation of a ground water basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use by intentionally recharging the basin during years of above-average water supply.

Decision 1485 operating criteria - standards for operating water project facilities under Water Rights Decision 1485 regarding the Sacramento-San Joaquin Delta and Suisun Marsh, adopted by the State Water Resources Control Board, August 1978.

Delta consumptive use - the sum of evapotranspiration and changes in soil moisture of Delta lands and evaporation from Delta channels.

Delta outflow index a - calculated approximation of this seaward freshwater outflow as it passes Chipps Island near Pittsburg, beyond the confluence of the Sacramento and San Joaquin Rivers.

depletion - the water consumed within a service area and no longer available as a source of supply.

dissolved organic compounds - carbon substances dissolved in water.

drainage basin - the area of land from which water drains into a river; for example, the Sacramento River Basin, in which all land area drains into the Sacramento River. Also called, "catchment area," "watershed," or "river basin."

drought condition - hydrologic conditions during a defined drought period during which rainfall and runoff are much less than average.

ecology - the study of the interrelationships of living organisms to one another and to their surroundings.

ecosystem - recognizable, relatively homogeneous units, including the organisms they contain, their environment, and all the interactions among them.

effluent - waste water or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant.

environment - the sum of all external influences and conditions affecting the life and development of an organism or ecological community; the total social and cultural conditions.

estuary - the lower course of a river entering the sea influenced by tidal action where the tide meets the river current.

evapotranspiration (ET) - the quantity of water transpired (given off), retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces. Quantitatively, it is usually expressed in terms of depth of water per unit area during a specified period of time.

evapotranspiration of applied water (ETAW) - the portion of the total evapotranspiration which is provided by irrigation.

forebay - a reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water levels; also a storage basin for regulating water for percolation into ground water basins.

fry - a recently hatched fish.

gross reservoir capacity - the total storage capacity available in a reservoir for all purposes, from the streambed to the normal maximum operating level. Includes dead (or inactive) storage, but excludes surcharge (water temporarily stored above the elevation of the top of the spillway).

ground water - water that occurs beneath the land surface and completely fills all pore spaces of the alluvium, soil or rock formation in which it is situated.

ground water basin - a ground water reservoir, defined by an overlying land surface and the underlying aquifers that contain water stored in the reservoir.

ground water overdraft - the condition of a ground water basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average.

ground water recharge - increases in ground water storage by natural conditions or by human activity.

ground water table - the upper surface of the zone of saturation, except where the surface is formed by an impermeable body.

hydraulic barrier - a barrier developed in the estuary by release of fresh water from upstream reservoirs to prevent intrusion of sea water into the body of fresh water.

hydrologic balance - an accounting of all water inflow to, water outflow from, and changes in water storage within a hydrologic unit over a specified period of time.

hydrologic basin - the complete drainage area upstream from a given point on a stream.

hydrologic region - a study area, consisting of one or more planning subareas.

joint-use facilities - specific pumping plants, power plants, canals, and reservoirs in which both State and federal agencies participated in the construction, use, and maintenance.

land subsidence - the lowering of the natural land surface in response to earth movements; lowering of fluid pressure (or lowering of ground water level); removal of underlying supporting materials by mining or solution of solids, either artificially or from natural causes; compaction caused by wetting (hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

megawatt - one million watts.

milligrams per liter (mg/L) - the weight in milligrams of any substance dissolved in one liter of liquid; nearly the same as parts per million.

natural flow - the flow past a specified point on a natural stream that is unaffected by stream diversion, storage, import, export, return flow, or change in use caused by modification in land use.

percolation - the downward movement of water throughout the soil or alluvium to a ground water table.

permeability - the capability of soil or other geologic formations to transmit water.

phytoplankton - minute plants, usually algae, that live suspended in bodies of water and that drift about because they cannot move by themselves or because they are too small or too weak to swim effectively against a current.

pollution (of water) - the alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.

prior water right - a water designation used for water delivered based on its use prior to SWP construction.

pumping-generating plant - a plant at which the turbine-driven generators can also be used as motor-driven pumps.

recharge basin - a surface facility, often a large pond, used to increase the percolation of surface water into a ground water basin.

riparian vegetation - vegetation growing on the banks of a stream or other body of water.

runoff - the total volume of surface flow from an area during a specified time.

Sacramento River index - the sum of the Sacramento Valley's unimpaired runoff at the following four locations: Sacramento River near Red Bluff; total Feather River inflow to Lake Oroville; Yuba River at Smartville; and total American River inflow to Folsom Lake.

salinity - generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. See ***total dissolved solids*** .

salinity intrusion - the movement of salt water into a body of fresh water. It can occur in either surface water or ground water bodies.

salt-water barrier - a physical facility or method of operation designed to prevent the intrusion of salt water into a body of fresh water.

sediment - soil or mineral material transported by water and deposited in streams or other bodies of water.

seepage - the gradual movement of a fluid into, through, or from a porous medium.

service area - the geographical land area served by a distribution system of a water agency.

snow water content - a calculated or measured amount of water contained in packed snow based on its depth and density.

spawning - the depositing and fertilizing of eggs (roe) by fish and other aquatic life.

streamflow - the rate of water flow past a specified point in a channel.

surplus water - developed water supplies in excess of contract entitlement or apportioned water.

total dissolved solids (TDS) - a quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter. See ***salinity***.

transpiration - an essential physiological process in which plant tissues give off water vapor to the atmosphere.

unimpaired runoff - represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds.

waste water - the water, liquid waste, or drainage from a community, industry, or institution.

water conservation - reduction in applied water due to more efficient water use.

water quality - used to describe the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose or use.

water right - a legally protected right to take possession of water occurring in a natural waterway and to divert that water for beneficial use.

water table - see ***ground water table***.

water year - a continuous 12-month period for which hydrologic records are compiled and summarized. In California, it begins on October 1 and ends September 30 of the following year.

watershed - see ***drainage basin***.